



अभियान

मुक्तिनाथ विकास बैंकको
'सेल्फ-रिन्यु' सुविधा 3

प्रिमियम मूल्यमा हकप्रद 8

स्नो रिभर्सको
आईपीओ बॉडफॉट 6विदेशमा रहेका नेपालीका लागि
'मोफा मित्र' एप सार्वजनिक ८

नेपाल सरकार

कृषि, वन तथा पर्यावरण मन्त्रालय

कोशी प्रदेश, भूपा जिल्ला, मेचीनगर नगरपालिकामा प्रस्तावित सिलिगुरी-भूपा पेट्रोलियम पाइपलाइनको नेपाल खण्ड तथा ग्रिन फिल्ड टर्मिनल आयोजनाको वातावरणीय प्रभाव मूल्याङ्कन (EIA) प्रतिवेदनमा राय-सुझावको लागि आह्वान गरिएको सार्वजनिक सूचना

प्रथम पटक प्रकाशित मिति: २०८३/०२/१३ गते

प्रस्तावक श्री नेपाल आयल निगम लिमिटेड द्वारा कोशी प्रदेश, भूपा जिल्लाको मेचीनगर नगरपालिका मा प्रस्तावित पेट्रोलियम पाइपलाइन तथा ग्रिन फिल्ड टर्मिनल आयोजनाको वातावरणीय प्रभाव मूल्याङ्कन (EIA) प्रतिवेदन उद्योग, वाणिज्य तथा आपूर्ति मन्त्रालय मार्फत यस मन्त्रालय मा स्वीकृतिका लागि प्राप्त भएको छ ।

प्राप्त प्रतिवेदनअनुसार काकरभिट्टा चारआली दुहागढी खण्डमा पूर्व-पश्चिम तथा मेची राजमार्गको क्षेत्राधिकारभित्र ८ इन्च व्यासको १४.६ कि.मि. पेट्रोलियम पाइपलाइन न्यूनतम १.२ मिटर गहिराइमा भूमिगत रूपमा विस्तार गरिनेछ । साथै मेचीनगर नगरपालिका वडा नं. १३ मा १२,३०० किलोलिटर डिजेल र ६,६०० किलोलिटर पेट्रोल भण्डारण क्षमताको ग्रिन फिल्ड टर्मिनल निर्माण तथा सञ्चालन गरिने प्रस्ताव छ । पाइपलाइन API 5L, ASME B31.4 लगायत अन्तर्राष्ट्रिय मापदण्डअनुसार निर्माण हुनेछ । आवश्यक स्थानमा Horizontal Directional Drilling प्रविधि प्रयोग गरिने तथा 3LPE Coating, Cathodic Protection, Optical Fiber SCADA System जस्ता सुरक्षा प्रणाली रहनेछन् । नेपाल आयल निगमको स्वामित्वमा रहेको २३ विघा ३ कठ्ठा १३ घुर क्षेत्रफलमा निर्माण हुने टर्मिनलमा इन्धन भण्डारण ट्याङ्क, ट्याङ्कर पार्किङ तथा लोडिङ क्षेत्र, सुरक्षा तथा प्रशासनिक भवन, अग्नि नियन्त्रण प्रणाली लगायतका संरचना रहनेछन् । इन्धन वाष्पीकरण नियन्त्रण, लिकेज तथा अग्नी सूचक तथा नियन्त्रण प्रणालीहरु जाडन गरिनेछन् । तरल फोहोर प्रशोधनका लागि Sludge Tank तथा Oil Water Separator को व्यवस्था हुनेछ ।

वातावरण संरक्षण नियमावली, २०७७ को नियम ९ (६) बमोजिम यस प्रतिवेदनमा राय सुझाव दिनका लागि सर्वसाधारणले प्रतिवेदन अध्ययन वा उतार गर्न सक्ने व्यवस्था रहेकोले देहायबमोजिमका स्थानहरूमा र यस मन्त्रालयको वेबसाइट (www.mofe.gov.np) मा यस आयोजनाको वातावरणीय प्रभाव मूल्याङ्कन (EIA) प्रतिवेदन सार्वजनिक गरिएको छ । प्रतिवेदनमा उपयुक्त राय सुझाव प्राप्त भएमा यस मन्त्रालयले उक्त प्रस्ताव कार्यान्वयनका लागि स्वीकृति दिने क्रममा त्यस्ता राय/सुझावहरूलाई समेत विचार गरिनेछ । सार्वजनिक गरिएको प्रतिवेदनका सम्बन्धमा सर्वसाधारण व्यक्ति वा संस्थाको कुनै राय/सुझाव भए यो सूचना प्रथमपटक प्रकाशित भएको मितिले सात (७) दिनभित्र आफ्नो लिखित राय सुझाव निम्न ठेगानामा पठाइदिनुहुन यसै सूचनाद्वारा आह्वान गरिन्छ ।

प्रतिवेदन अध्ययन वा उतार गर्न सकिने स्थानहरू:

श्री उद्योग, वाणिज्य तथा आपूर्ति मन्त्रालय, सिंहदरवार, काठमाडौं
श्री नेपाल आयल निगम लिमिटेड, केन्द्रीय कार्यालय, बबरमहल, काठमाडौं
श्री नेपाल आदिवासी जनजाति महासंघ, सिनामंगल, काठमाडौं
श्री जिल्ला समन्वय समितिको कार्यालय, भद्रपुर भूपा
श्री मेचीनगर नगरपालिका, नगर कार्यपालिकाको कार्यालय, ईटाभट्टा, भूपा

राय/सुझाव पठाउने ठेगाना:

कृषि, वन तथा पर्यावरण मन्त्रालय
वातावरण प्रभाव अध्ययन शाखा
सिंहदरवार, काठमाडौं ।

फोन नं.: ०१-४२९१५६७, ०१-४२९१६३८; फ्याक्स नं.: ०१-४२९१८६८; ईमेल: info@mofe.gov.np

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

FOR
**NEPAL SECTION SILIGURI-JHAPA PETROLEUM PIPELINE
AND GREEN FIELD TERMINAL PROJECT**

Mechinagar Municipality, Jhapa District, Koshi Province, Nepal

Submitted To:

Nepal Government

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and Environment (MoFE)**

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Submitted Through:

Government of Nepal

**Ministry of Industry, Commerce
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May, 2026

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EXECUTIVE SUMMARY OF EIA REPORT

1. Background

The proposed Siliguri–Jhapa Petroleum Pipeline (SJPL) Project, along with the development of a Green Field Terminal (GFT) at Charali, Jhapa, is a strategic infrastructure initiative aimed at strengthening Nepal’s petroleum supply system. The project is being implemented under a government-to-government agreement between Nepal and India, with technical and financial support from Indian Oil Corporation (IOC).

2. Proponent

The project is proposed by Nepal Oil Corporation (NOC), specifically through its Department of Engineering, Project, and Information Technology. The EIA study was executed by Redknot Engineering Consultant Private Limited, acting as the authorized environmental consultant to ensure all statutory requirements of the Ministry of Forests and Environment (MoFE) are met.

3. Rationality and Objectives of EIA

According to Sub-section 30 of Section (J) of Schedule-3 under Rule 3 of the Environmental Protection Regulations, 2077 (2020 AD), it is mandatory to conduct an Environmental Impact Assessment (EIA) for a proposed petroleum pipeline construction project. Additionally, in accordance with the provisions of the Environmental Protection Act, 2019, the Environmental Protection Regulation, 2020, and other relevant laws, it is necessary to assess the environmental impact of the proposed project.

The primary objective of this Environmental Impact Assessment (EIA) is to identify, predict, and evaluate the potential environmental and socio-economic impacts associated with the construction and operation of the project. The study also aims to recommend appropriate mitigation measures to minimize adverse impacts and enhance positive outcomes. The assessment covers physical, biological, socio-economic, and cultural environments within the defined Direct Impact Area and Indirect Impact Area (beyond the direct zone).

4. Project Description

The SJPL Project involves the construction of an approximately 49.6 km long petroleum pipeline, of which 14.6 km lies within Nepalese territory. The pipeline will transport petroleum products from Siliguri, India to Jhapa, Nepal. The pipeline will be installed underground at a minimum depth of 1.2 meters along the Right of Way (RoW) of the East-West Highway and Mechi Highway, thereby minimizing the need for land acquisition and reducing potential environmental and social impacts.

A major component of the project is the establishment of the Jhapa Green Field Terminal (GFT) at Charali, Mechinagar Municipality. The terminal will have a total storage capacity of 18,900 kiloliters and will include tank farms, truck loading facilities, pumping systems, automation systems, fire protection systems, and other supporting infrastructure. The terminal is designed with provisions for future expansion and integration of biofuels such as ethanol and biodiesel.

5. EIA Study Methodology

The study methodology for this petroleum pipeline and Green Field Terminal (GFT) project integrated desk reviews, field investigations, and extensive stakeholder engagement. During the desk study, relevant literature was reviewed, including the project's feasibility report, and prevailing national regulations. Demographic data for the affected municipality and wards were analyzed using reports from the National Statistics Office to establish a socio-economic baseline.

Field surveys were conducted from October- November 2025 to collect primary data across physical, biological, and socio-economic environments. The physical assessment involved site inspections to identify land use land cover pattern, crossings and slope instability along the pipeline. Environmental quality was established by analyzing water samples and monitoring air and noise levels at 3 strategic locations. For the biological environment, data were gathered through sampling, direct observation and identifying signs of wildlife presence.

The social assessment used a participatory framework, including 6 formal consultation meetings and 8 informal focus group discussions with local leaders and forest officials. To capture household-level data, a socio-economic survey was executed, completing 189 households regarding settlement patterns, ethnic compositions, and public utilities.

As per the notice published on 'Aarthik Abhiyan National Daily' on 16 October, 2025 (30th Kartik, 2082 B.S), the public hearings were held in Mechinagar Municipality Assembly Hall and at proposed Green Field Terminal, Charali on 23rd Nov, 2025 (BS: Mangsir 7, 2082) in the morning and afternoon respectively. These sessions were chaired by Mechinagar Municipality's Mayor in presence of Deputy-Mayor, affected Ward-Chairpersons, local residents. All feedback was recorded in the official minutes, with a summary of issues raised.

Finally, potential environmental and social impacts were systematically evaluated using an impact assessment matrix to determine the magnitude, extent, and duration of the project's influence.

6. Baseline Environmental Conditions

Physical Environment

Topography

The proposed petroleum pipeline lies in the Eastern Terai Region of Nepal. The topography of project area is characterized by plain and flat land. The pipeline alignment elevation profile ranges between 117-145 masl, the overall pipeline route maintains a relatively low and consistent elevation profile across this section.

The project area falls under a Tropical Climate Zone, characterized by high humidity and heavy monsoonal influence. Monthly minimum temperature variations range from an average of 10°C to a maximum average of 26°C and average maximum temperature in between 26 °C to 33°C. The area receives a substantial annual rainfall of 2426mm. The extreme variation between the driest (December) and wettest (July) months-ranging from an average of 7mm to 683mm-necessitates strategic construction scheduling to avoid monsoon-related trench flooding and soil instability.

Land Use

The pipeline alignment primarily follows the existing national highway corridor. The current land use distribution within 500 meter buffer of the proposed pipeline alignment is as follows:

- **Settlements & Agriculture (84%):** Predominantly concentrated in urban hubs and village clusters along the highway.
- **Forestland (15%):** Segments passing through regional forest patches.
- **Water Bodies & Others (1%):** River crossings and wetlands.

The high concentration of settlements indicates that approximately **80%** of the route falls under Population Density Index (PDI) Zone III, requiring high-grade steel and advanced safety factors.

Hydrology and Drainage

The corridor intersects seasonal and perennial river systems, including the Mechi, Kali, Ninda, Timai, Hadiya, Phulbasa. Among these rivers, Mechi, Ninda and Hadiya are characterized by loose fluvial sediments (sands and pebbly sands).

- **River Morphology:** Mechi and Ninda show the meandering and depositional characteristics and others are somehow straight. Active bank erosion and scouring were not identified as bridge foundation work was under construction.
- **Pipeline lying mechanism:** The application of Horizontal Directional Drilling (HDD) will be carried out to these sites to ensure pipeline integrity against seasonal flooding.

Environmental Quality

Baseline monitoring established the existing environmental stressors:

- **Air quality parameters** (PM10, PM2.5, SO₂, NO₂, CO) are within national standards.
- **Noise levels** are generally acceptable during daytime but exceed permissible limits at night in some areas.
- **Water quality** is largely suitable for use, with minor biological contamination concerns.

Natural Hazards and Seismic Risk

- **Seismicity:** The alignment is located within a moderate seismic hazard zone. The design must incorporate stress analysis for potential ground movement.
- **Flood Vulnerability:** Flood-prone zones are identified at the Mechi and Ninda river basins. Recurrent sediment deposition and waterway encroachment in these areas necessitate specialized bank protection and concrete coating (buoyancy control) for the pipeline.

Biological Environment

The pipeline route does not pass through any protected areas such as National Parks, Conservation areas, wildlife Reserve, Hunting Reserve, Protected Forest areas and animal sanctuaries. The nearby forest area is Charali Forest Block separated by Mechi highway. The Charali Forest is distributed with Sal (*Shorea robusta*) forest and Dalbergia sissou forest types. Sal (*Shorea robusta*) is dominant forest species. The associated species include Saj (*Terminalia alata*), Khair (*Acacia catechu*), Simal (*Bombax ceiba*), Sindure (*Mallotus philipensis*), Rajbrikshya (*Cassia fistula*), Badkamle (*Caesaria glomerata*), Bot Dhayero (*Lagerstroemia parviflora*), and Kusum (*Schleichera oleosa*). The shrub layer is occupied by *Murraya koenigii*, Angeri (*Melastoma normale*) and *Clausena exavata*, etc.

Despite being isolated, the Charaali forest supports resident of Asian elephants for months and serves as a vital transitional corridor for migratory herds traveling from India to Jalthal. The north-south wildlife movement corridor is, as stated by the locals is India ≈ Bahundangi (Churia foot hills) ≈ Daijan ≈ Charali ≈ Jalthal. Sometime, the elephants travel to Charali

directly from Panitanki, India, in small groups of 7 to 9 and visit Jalthal from there and back the same route.

Socio-economic and Cultural Environment

The project avoids private property impacts and relocation by utilizing the government-owned highway Right of Way (RoW) for pipeline trenching. Furthermore, a demographic survey of 189 households along the route was conducted. The municipality has a total of 32,695 households. The housing infrastructure in the project area is predominantly permanent, with both 2021 Census data and 2025 field observations confirming that over 77% of households are constructed from durable cement-bonded bricks or stone. Mechinagar Municipality's affected population of 67,030 exhibits a slightly higher female ratio and a settlement pattern entirely divided between urban (Wards 6 and 10) and peri-urban (Wards 7, 8, 13, and 14) areas, with no rural inhabitants reported. Analysis of 189 surveyed households reveals a stable economic profile with a significant savings capacity, as 84% maintain monthly expenses below 50,000 NRs despite 27% of the community earning over 75,000 NRs, indicating strong financial resilience and disposable income. The project area features a rich cultural mosaic of Hindu, Buddhist, Kirat, Islam, and Christian faiths, supported by a diverse population of Khas Arya, Rai, Limbu, Tharu, Santhal, and indigenous Rajbanshi or Dhimal communities. While Dashain and Tihar are celebrated across the region, the social calendar is further enriched by ethnic-specific milestones such as the Rai's Udhauli and Ubhauri, the Tharu's Maghi, and the Lhosar festivals observed by Gurung and Tamang communities.

Analysis of Alternatives

The EIA considered multiple alternatives, including:

- **No Project Scenario:** Rejected due to continued reliance on tanker transport, leading to higher costs, traffic congestion, increased emissions, fuel losses, and supply disruptions.
- **Alignment Alternatives:**
 - *Alternative 1:* Shorter route through private land, requiring land acquisition and causing higher environmental and social impacts.
 - *Alternative 2 (Selected):* Alignment along existing highway RoW, minimizing displacement, environmental damage, and implementation time.

The selected alternative demonstrates superior environmental, social, and economic feasibility.

7. Environmental Impacts and Mitigation Measures

The environmental impacts and mitigation measures of the project implementation is mention below;

Beneficial Impacts and Augmentation measures

Construction Phase

The primary focus during construction is the maximization of local economic benefits through human-centric management and procurement. Labor-based construction techniques will be prioritized to ensure that job opportunities remain within the community, backed by a commitment to full and timely wage payments as strictly defined in contract agreements. Beyond direct employment, the project aims to stimulate local entrepreneurship by sourcing

essential construction materials-such as sand, gravel, and bricks-from community suppliers and utilizing local services for transport, catering, and maintenance. The physical presence of the workforce will serve as a catalyst for growth, encouraging the establishment of small-scale tea shops, grocery stores, and restaurants near construction camps to boost local household income.

Operation Phase

During the operation phase, the project transitions to a high-tech framework designed for efficiency, safety, and environmental sustainability. To ensure a reliable flow of petroleum and eliminate road-based disruptions, the pipeline will utilize automated flow controls, leak detection, and friction-reducing chemical additives. Structural integrity is a top priority; the pipeline will be buried at safe depths, especially at river and drain crossings, and protected by a Cathodic Protection system to prevent soil-based corrosion. Real-time monitoring will be facilitated through Fiber-Optic Sensing and regular ground patrols.

Environmentally, the project aims to reduce greenhouse gas emissions and oil tanker running costs by integrating a fully closed receiving terminal. This terminal will feature high-speed automated loading arms and a Vapor Recovery System (VRS) at green field terminals to capture and recycle fuel vapors. Long-term socio-economic growth will continue through the operation of the Greenfield Terminals (GFT), which will provides a sustained boost to local businesses-including hotels, accommodations, and grocery stores-serving the operational personnel and the growing local population.

Adverse Impacts and Mitigation Measures for Petroleum Pipeline

Environmental Impacts/Issues	Mitigation Measures
A.	Physical and Chemical Environment
I.	Construction Phase
Damage of existing infrastructure	The damaged road during the excavation will be rehabilitated as soon as possible. The excavation will be conducted in strict coordination with the Department of Road, Drinking Water Committee and other relevant authorities to prevent accidental service disruptions. A specific safety distance will be maintained between the petroleum pipeline and the drinking water network to mitigate contamination risks, while the project mandates that the portion of the highway damaged during construction be fully rehabilitated to its original condition.
Generation of Muck and Spoils	The project will prioritize a balanced cut-and-fill approach, where nearly all excavated material is repurposed as backfill to minimize environmental disturbance and eliminate the need for external spoil disposal. In the event that excess spoil is generated, it will be managed internally by using the designated terminal site for disposal, ensuring no unauthorized dumping occurs in the surrounding landscape.

Environmental Impacts/Issues	Mitigation Measures
Noise and vibration	To minimize acoustic disturbance, the project will equip all construction machinery with properly maintained silencers and restrict work to daylight hours to avoid disrupting the local community's rest. Protective gear, such as earplugs or earmuffs, will be mandatory for workers operating high-noise equipment, while physical noise barriers will be deployed to shield sensitive receptors like schools and hospitals. Additionally, periodic noise quality monitoring will be conducted throughout the project area to ensure continuous compliance with national noise standards.
Temporary deterioration of air quality	To mitigate atmospheric impacts, pipeline trenching will be executed in segments to minimize soil exposure and dust. Additionally, regular air quality monitoring at terminal sites and construction camps will ensure adherence to National and WHO standards.
Crossing across the river and drains	The project will utilize Horizontal Directional Drilling (HDD) to lay the pipe deep beneath the riverbed, avoiding any physical disturbance to the banks. Construction activities will be strictly suspended during the monsoon season.
Backfilling and reinstatement	Backfilling will be performed immediately after pipe laying to minimize the duration of stockpiling, and any excess soil will be disposed of at pre-approved, engineered tipping sites.
II.	Operational Phase
Petroleum Pipeline corrosion and leaks	To prevent environmental risks, the pipeline will be equipped with a Cathodic Protection (CP) system and a factory-applied coating to inhibit external corrosion and rust. Operational safety will be managed via a SCADA system, providing real-time monitoring of pressure drops and vibrations for immediate hazard detection. Before commissioning, the entire system will undergo hydrostatic testing at 125% of the design operating pressure to rigorously verify weld integrity and structural strength.
Impacts due to Geological Hazards	The pipeline will be constructed using high-ductility steel and flexible joints designed to absorb ground movement and prevent rupturing. For river crossings, the pipe will be buried 4–6 meters below the maximum scour depth to ensure protection against flash floods and channel erosion. Additionally, the system will integrate vibration and strain-gauge sensors linked to the SCADA system, enabling an automatic fuel shut-off the moment a seismic or accidental event is detected.
Expose due to road collapse	The pipeline will be installed at a minimum depth of 1.2–2 meters and positioned at a safe horizontal distance from the road shoulder to ensure continuous coverage even in the event of embankment failure. Furthermore, regular on-foot inspections will be conducted along the route to ensure early detection of shoulder cracks or potential instability.
B.	Biological Environment
I.	Construction Phase

Environmental Impacts/Issues	Mitigation Measures
Possible conflict with wildlife	<ul style="list-style-type: none"> • Pipeline trenching work will be on daylight hours while working near to the forest. • The existing fencing will maintain effectively for the proper function in coordination with forest authorities.
C.	Socio-Economic and Cultural Environment
I.	Construction Phase
Issues related to road safety and traffic disruption	To ensure public safety, high-visibility barriers and reflective safety tape will be installed around all open trenches and equipment areas to prevent pedestrians or vehicles from entering work zones. Project vehicles will be restricted to a limited speed of in residential areas and will travel in timed convoys to minimize traffic disruption.
Blocked of feeder road	Retro reflective warning signs, and barrier will be installed ahead of the highway intersection to alert highway commuters. The alternative route will be utilized for the access to the highway.
Occupational health and safety of the workers	The project mandates a robust safety culture through daily and weekly toolbox talks and visual safety signage across all sites. All personnel will receive job-specific PPE, supported by on-site first aid and emergency rescue facilities. A designated officer will enforce a comprehensive OHS Plan, while fully equipped worker camps with sanitation and kitchens will be provided to minimize social friction with local communities.
Potential for the conflict between the workers	The project will conduct orientations and toolbox talks to bridge language gaps and foster a unified safety culture among the workforce. Additionally, a dedicated grievance redressal unit will be established to promptly address and resolve any issues or conflicts that arise during the construction phase.
II.	Operational Phase
Third party Interference	A bright yellow warning tape will be buried 300–500 mm above the pipe, with route markers placed every 100–200 meters. NOC will enforce a center that contractors must contact before any mechanical excavation. Furthermore, contractors must manually verify the pipe's exact location and depth via hand-digging before using heavy machinery, rather than relying solely on map data.
Pipeline safety and security	The pipe will be designed to withstand external loads and traffic vibrations in accordance with Indian Standards. To further minimize stress, the pipeline will be laid within 2 meters of the Right of Way (RoW) edge and buried at a minimum depth of 1.2 meters below the road surface. Additionally, regular patrolling will be conducted to monitor the integrity of the pipeline route.

Adverse Impacts and Mitigation Measures for Green Field Terminal

Impacts/Issues	Mitigation Measures
A.	Physical and Chemical Environment
I.	Construction Phase

Impacts/Issues	Mitigation Measures
Installation of camp sites and stockpiling sites	Worker camp will be located within the terminal property and barricaded to protect local residents. All construction materials will be enclosed with side barriers and covered with tarpaulins to prevent dust and erosion. Furthermore, hazardous chemicals will be stored on hard, impermeable surfaces to prevent soil and water contamination.
Worker-generated waste.	The project will implement a mandatory three-bin system for biodegradable, recyclable, and hazardous waste to ensure sorting at the source. Partnerships with local municipal authorities will facilitate regular collection, and all temporary camps will be fully cleared of waste upon completion.
Land development	A three-meter-high wall will be constructed to secure the fill area perimeter, using material sourced exclusively from government-approved quarries. Landfilling will be executed in mechanically compacted layers to prevent subsidence, supported by a peripheral drainage system inside and outside the boundary to prevent waterlogging. Additionally, topsoil will be stripped and banked before filling begins, ensuring fertile soil is preserved for future landscaping and greenery.
Diversion of Natural Drainage	A diverted canal-measuring 2 meters wide and 1-1.5 meters deep-will be constructed just outside the boundary wall and linked to existing inflow and outflow systems. Additionally, a comprehensive stormwater drainage network will be developed within the terminal to prevent potential waterlogging.
Obtaining the filling material	Filling materials will be sourced exclusively from legally operating quarry or crusher industries that possess all necessary permits and approvals from relevant authorities. To ensure technical standards are met, the quality of these materials will be rigorously inspected and verified by engineers at the terminal site.
Air quality degradation and noise pollution	To minimize environmental impact and community disturbance, all trucks transporting filling materials must be covered with tarpaulins to prevent road spillage. The access road will be regularly maintained to ensure smooth traffic flow and reduce vehicular noise. Additionally, DG sets will be acoustically insulated and fitted with exhaust pipes that meet government pollution norms.
II.	Operation Phase
Terminal Safety and Security	To ensure site security, a three-meter-high perimeter wall will be constructed around the fill area. Access to the terminal will be strictly limited to authorized personnel only, managed through a gate with 24/7 security guards and an integrated CCTV monitoring system to maintain continuous surveillance.
Fire safety concern	Terminal layout and tank spacing will comply with OISD-STD-118 to prevent fire spread. The facility will include two fire water tanks-each 16 m in diameter and 18.5 m high-along with fire and foam pumps and a comprehensive hydrant network for emergency response.

Impacts/Issues	Mitigation Measures
Flood/Inundation risk	Terminal elevation is determined by flood and inundation analysis of the nearby Phulbasa River to ensure long-term resilience. To manage water flow, a peripheral drainage system-2 meters wide and 1–1.5 meters deep-will be engineered to intercept off-site runoff and prevent damming in upstream areas. Additionally, an efficient internal drainage network will be developed within the GFT to manage on-site runoff during extreme weather.
Soil and Water pollution	HSD and MS storage tanks will be enclosed by a dyke wall capable of holding 110% of the total tank volume to ensure spill containment. In parking and fueling areas, a 35 m x 15 m oil-water separator will be integrated into the drainage system to filter fuel and lubricants before discharge. Additionally, rapid-response spill kits with absorbent mats and sand will be stationed at all high-risk locations for immediate emergency use.
Fugitive emission	Floating roof tanks will be used to eliminate headspace and prevent fuel volatilization, while loading bays will feature Vapor Recovery Units (VRUs) to convert vapors back into liquid. To further reduce emissions, bottom loading will be used to minimize turbulence, and specialized systems will capture Volatile Organic Compounds (VOCs) at fueling stations. These technical measures will be supported by a Leak Detection and Repair (LDAR) program.
Pigging	To maintain pipeline integrity and prevent blockages, a step-by-step pigging approach will be adopted. The process will feature real-time tracking and pressure monitoring systems to ensure operational safety. Furthermore, the entire pigging operation will remain a closed system, with all waste discharged in strict compliance with national effluent standards.
B.	Biological Environment
I.	Construction Phase
Impacts on wildlife and avifauna	Mandatory staff induction will cover wildlife protection and legal compliance, strictly prohibiting poaching or unauthorized tree felling. Labor camps will use subsidized LPG or electricity to prevent forest encroachment, while all hot work must follow rigorous fire safety precautions.
Illegal wildlife hunting and poaching	Workers are strictly prohibited from hunting, poaching, or any illegal activities. Informative warning signs will be placed at construction sites, and contractors will be held strictly liable for enforcing these wildlife protection specifications among their labor force.
II.	Operation Phase
Effect on flora and fauna due to accidental leak of petroleum products	In case of accidental leak of petroleum products, the soil will be treated by biodegradation method. This treatment also combines injection of degrading bacteria and nutrients into soil to stimulate biodegradation.
C.	Socio Economic and Cultural Environment
I.	Construction Phase

Impacts/Issues	Mitigation Measures
Arrangement of basic facilities	The terminal will feature adequate worker living quarters with properly located sanitation facilities. Water will be sourced from on-site tube wells, while electricity will be provided by the NEA with DG set backup. Additionally, color-coded bins will ensure waste segregation at the source.
Workers occupational health and safety	Daily and weekly toolbox talks, along with visual signage, will ensure continuous safety education for all workers. Full personal protective equipment (PPE) is mandatory for staff and visitors, supported by on-site first aid. All construction activities will strictly adhere to Occupational Health and Safety (OHS) standards.
Increase in traffic volume Potential increase in road traffic incidents	Large, slow-moving vehicles will operate during off-peak hours to minimize traffic disruption. The project will repair any road damage caused and install visible warning signs. Additionally, the workforce will receive first-aid training.
II.	Operation Phase
Community Health and Safety	A community-integrated Emergency Response Plan will include sirens, PA systems, and evacuation routes for neighbors. Fuel tankers are prohibited from roadside parking, and green buffer zones will be maintained. All site waste will be treated before discharge, while a feedback box will address community concerns.
Occupational Health and Safety	The terminal will be mapped into zones based on the risk. A mandatory PPE policy will be enforced.
Fire safety and prevention	Vapor Recovery Units (VRUs) will capture evaporated gases to prevent possible fire. The terminal will maintain a hydrant system with two 3,719.64 KL water tanks, portable DCP and CO ₂ extinguishers, and a dedicated foam tender vehicle.
Possible soil and water contamination	Site drainage passes through 35 m x 15 m oil-water separators and a 100 KL sludge tank. Groundwater monitoring will be regularly conducted to ensure no hydrocarbon seepage.

8. Environment Management Plan and Environmental Monitoring Plan

An Environmental Management Plan (EMP) with details on mitigation measures, timing and location for implementing the mitigation measures, costs and responsible agencies and supervising the mitigation measures is prepared. In addition, an Environmental Monitoring Plan (EMoP) has been prepared to guide key monitoring activities to ensure effectiveness of EMP implementation. The Nepal Oil Corporation/ SJPL Project Unit will be the implementing agency for the project and will be responsible for the overall implementation of environment safeguards under the project. The cost for the project impact enhancement measures and mitigation measures on physical, biological, socio-economic, and cultural environment is estimated NRs. 4,205,000/- has been proposed, similarly, NRs 16,60000 is proposed for environmental monitoring.

9. Grievance Redress Mechanism (GRM)

A structured four-tier GRM has been established to address stakeholder concerns:

1. **Site Level** – Immediate resolution by contractor and site office.
2. **Project Level** – Escalation to Project Implementation Unit (PIU).
3. **Department Level** – Review by Grievance Redress Committee.
4. **Judicial Level** – Legal recourse if required.

This ensures transparency, accountability, and community participation.

10. Environmental Auditing

Environmental impact audit will be carried out to assess the actual environmental impact, effectiveness of environmental impact mitigation, and enhancement measures and functioning of monitoring mechanisms. Audit will be undertaken after two years from the project completion. Ministry of Forests and Environment or prescribed body will conduct environmental auditing.

11. Conclusion

The Siliguri–Jhapa Petroleum Pipeline is a landmark cross-border G2G project connecting India’s Siliguri Terminal to a new 18,900 KL Green Field Terminal in Charali, Nepal. Stretching 49.6 km-with 14.6 km inside Nepal-the underground pipeline primarily utilizes the existing East–West and Mechi Highway Right-of-Way (RoW) to minimize land acquisition and environmental disruption.

By replacing tanker-based transport, the project enhances energy security while reducing traffic congestion, emissions, and fuel loss. The EIA confirms that the alignment avoids forest areas, and construction impacts-such as dust, noise, and excavation-will be temporary. To protect sensitive areas like water bodies and road crossings, Horizontal Directional Drilling (HDD) will be employed.

During operations, risks are minimized through advanced leak detection, optical fiber monitoring, and fire-safety systems at the Jhapa Terminal. The EIA concludes that the project’s economic and safety benefits significantly outweigh its manageable environmental impacts, provided the Environmental Management Plan (EMP) is strictly followed.

Key Commitments

- NOC will implement all EMP mitigation and monitoring measures.
- Trenchless HDD technology will be used at water bodies and congested crossings.
- The damaged road will be restored immediately.
- A comprehensive oil spill and emergency response framework will be enforced.
- Regular air, noise, and soil monitoring will be conducted alongside mandatory environmental audits per the Environment Protection Act.
- Stringent health, safety, and traffic protocols will be maintained, ensuring continuous coordination with concern authorities.

कार्यकारी सारांश

क. पृष्ठभूमि

प्रस्तावित सिलिगुरी-झापा पेट्रोलियम पाइपलाइन (SJPL) परियोजना, साथै झापा जिल्लाको चारआलीमा ग्रीन फिल्ड टर्मिनल (GFT) को विकास, नेपालको पेट्रोलियम आपूर्ति प्रणाली सुदृढीकरण गर्ने उद्देश्यले अगाडि बढाइएको एक रणनीतिक पूर्वाधार परियोजना हो। उक्त परियोजना नेपाल र भारतबीचको सरकार-सरकार (Government-to-Government) सम्झौता अन्तर्गत कार्यान्वयन भइरहेको छ, जसमा Indian Oil Corporation (IOC) बाट प्राविधिक तथा आर्थिक सहयोग प्रदान गरिएको छ।

ख. प्रस्तावक

यस नेपाल सिमा भित्र पर्ने परियोजना खण्डको वातावरणीय प्रभाव मूल्याङ्कनको प्रस्ताव नेपाल आयल निगम लिमिटेड द्वारा प्रस्तावित गरिएको हो भने वातावरणीय प्रभाव मूल्याङ्कन (EIA) अध्ययन रेडनट इन्जिनियरिङ्ग कन्सल्टेन्ट प्रा.लि. द्वारा सम्पन्न गरिएको हो।

ग. वातावरणीय प्रभाव मूल्याङ्कन को औचित्य तथा उद्देश्य

वातावरण संरक्षण नियमावली, २०७७ को नियम ३ अन्तर्गत अनुसूची-३ (ज) उद्योग क्षेत्र (३०) अनुसार प्रस्तावित पेट्रोलियम पाइपलाइन निर्माण परियोजनाका लागि वातावरणीय प्रभाव मूल्याङ्कन अनिवार्य गरिएको छ। साथै, वातावरण संरक्षण ऐन, तथा सो को नियमावली, तथा अन्य प्रासंगिक कानूनी व्यवस्थाहरूको प्रावधानअनुसार प्रस्तावित परियोजनाको वातावरणीय प्रभावको मूल्याङ्कन गर्नु आवश्यक हुन्छ।

यस वातावरणीय प्रभाव मूल्याङ्कनको प्रमुख उद्देश्य परियोजनाको निर्माण तथा सञ्चालनसँग सम्बन्धित सम्भावित वातावरणीय तथा सामाजिक-आर्थिक प्रभावहरूको पहिचान, पूर्वानुमान तथा मूल्याङ्कन गर्नु हो। यस अध्ययनले नकारात्मक प्रभावहरूलाई न्यूनीकरण गर्न तथा सकारात्मक प्रभावहरूलाई अभिवृद्धि गर्न उपयुक्त न्यूनीकरण उपायहरू सिफारिस गर्ने लक्ष्य समेत राखेको छ। उक्त मूल्याङ्कनले प्रत्यक्ष प्रभाव क्षेत्र तथा अप्रत्यक्ष प्रभाव क्षेत्र भित्र पर्ने भौतिक, जैविक, सामाजिक-आर्थिक तथा सांस्कृतिक वातावरणलाई समेटेको छ।

घ. परियोजनाको विवरण

सिलिगुरी-झापा पेट्रोलियम पाइपलाइन परियोजनामा करिब ४९.६ कि.मी. लामो रहेको छ, जसमध्ये करिब १४.६ कि.मी. भाग नेपाल भित्र पर्दछ। उक्त पाइपलाइनले सिलिगुरी, भारतबाट झापा, नेपालसम्म पेट्रोलियम पदार्थहरू ढुवानी गर्नेछ। पाइपलाइनलाई पूर्व-पश्चिम राजमार्ग तथा मेची राजमार्गको अधिकार क्षेत्र (Right of Way – RoW) दक्षिण किनारादेखि २-३ मि. दुरीमा न्यूनतम

१.२ मिटर गहिराइमा भूमिगत रूपमा स्थापना गरिनेछ, जसले गर्दा सम्भावित वातावरणीय तथा सामाजिक प्रभावहरूमा कमी आउनेछ।

परियोजनाको एक प्रमुख अङ्गको रूपमा चारआलीमा अवस्थित ग्रीन फिल्ड टर्मिनलको स्थापना गरिनेछ। उक्त टर्मिनलको कुल भण्डारण क्षमता १८,९०० किलोलीटर हुनेछ र यसमा ट्यांक फार्म, ट्रक लोडिङ सुविधा, पम्पिङ प्रणाली, स्वचालन प्रणाली, अग्नि सुरक्षा प्रणाली तथा अन्य सहायक पूर्वाधारहरू समावेश रहनेछन्। साथै, यस टर्मिनललाई भविष्यमा विस्तार गर्न सकिने प्रावधानहरू समेत राखिएको छ।

ड. वातावरणीय प्रभाव मूल्यांकन अध्ययन विधि

यस पेट्रोलियम पाइपलाइन तथा ग्रीन फिल्ड टर्मिनल (GFT) परियोजनाको अध्ययन विधिमा डेस्क अध्ययन, क्षेत्रीय अन्वेषण तथा सरोकारवालासँग व्यापक अन्तरक्रिया समावेश गरिएको थियो। डेस्क अध्ययनको क्रममा परियोजनाको सम्भाव्यता प्रतिवेदन तथा विद्यमान राष्ट्रिय कानुनी व्यवस्थाहरू लगायत सान्दर्भिक साहित्यहरूको समीक्षा गरिएको थियो। प्रभावित नगरपालिका तथा वडा क्षेत्रहरूको जनसांख्यिकीय तथ्याङ्कलाई राष्ट्रिय तथ्याङ्क कार्यालयका प्रतिवेदनहरूको आधारमा विश्लेषण गरी सामाजिक-आर्थिक आधाररेखा तयार गरिएको थियो।

स्थलगत सर्वेक्षणहरू अक्टोबर-नोभेम्बर २०२५ सम्म सञ्चालन गरी भौतिक, जैविक तथा सामाजिक-आर्थिक वातावरणसम्बन्धी प्राथमिक तथ्याङ्क सङ्कलन गरिएको थियो। भौतिक वातावरणको मूल्याङ्कन अन्तर्गत पाइपलाइन मार्गमा भूमि-उपयोग तथा भू-आवरण ढाँचा, क्रसिड क्षेत्रहरू तथा ढलान अस्थिरता पहिचान गर्न स्थलगत निरीक्षण गरिएको थियो। वातावरणीय गुणस्तर निर्धारणका लागि ११ स्थानहरूबाट पानीका नमूनाहरूको विश्लेषण तथा आयोजना क्षेत्रमा तीनवटा स्थानहरूमा वायु तथा ध्वनि स्तरको मापन गरिएको थियो। जैविक वातावरणको अध्ययनका लागि नमूना सङ्कलन, प्रत्यक्ष अवलोकन तथा वन्यजन्तुको उपस्थितिका संकेतहरूको पहिचान गरिएको थियो।

सामाजिक मूल्याङ्कन सहभागीमूलक ढाँचामा आधारित थियो, जस अन्तर्गत औपचारिक परामर्श बैठक तथा अनौपचारिक समूह केन्द्रित समूह छलफलहरू स्थानीय जनप्रतिनिधि, सरोकारवाला तथा वन अधिकारीहरूसँग सञ्चालन गरिएको थियो। घरधुरी स्तरको तथ्याङ्क सङ्कलनका लागि प्रश्नावलीहरू प्रयोग गरी १८९ घरधुरीको सामाजिक-आर्थिक सर्वेक्षण सञ्चालन गरिएको थियो, जसमा बसोबासको ढाँचा, जातीय संरचना तथा सार्वजनिक सेवासुविधासम्बन्धी विवरणहरू समेटिएका थिए। अन्ततः, सम्भावित वातावरणीय तथा सामाजिक प्रभावहरूको मूल्याङ्कन प्रभाव मूल्याङ्कन म्याट्रिक्सको प्रयोगमार्फत प्रणालीबद्ध रूपमा गरिएको थियो, जसद्वारा प्रभावको परिमाण, क्षेत्रीय विस्तार तथा अवधिको निर्धारण गरिएको थियो।

मिति २०८२ कार्तिक ३० गते आर्थिक अभियान राष्ट्रिय दैनिकमा प्रकाशित सूचना अनुसार, २०८२ साल मंसिर ७ गते (सन् २०२५ नोभेम्बर २३) बिहान र दिउँसो क्रमशः मेचीनगर नगरपालिकाको सभाहल र चारआलीस्थित प्रस्तावित 'ग्रीन फिल्ड टर्मिनल' मा सार्वजनिक सुनुवाइ कार्यक्रमहरू सम्पन्न गरियो। उक्त कार्यक्रमको अध्यक्षता मेचीनगर नगरपालिकाका प्रमुख (मेयर) तथा मे.न.पा. वडा-१३ को अध्यक्ष ले गर्नुभएको थियो भने कार्यक्रममा उप-प्रमुख, प्रभावित वडाका वडाध्यक्षहरू र स्थानीय बासिन्दाहरूको उपस्थिति रहेको थियो। कार्यक्रममा प्राप्त भएका सबै सुझाव तथा प्रतिक्रियाहरूलाई उठाइएका मुद्दाहरूको सारांशसहित आधिकारिक माइन्सुट मा लिपिबद्ध गरिएको छ।

च. आधारभूत वातावरणीय अवस्था

भौतिक वातावरण

स्थलाकृति

प्रस्तावित पेट्रोलियम पाइपलाइन नेपालको पूर्वी तराई क्षेत्रमा अवस्थित छ। परियोजना क्षेत्रको स्थलाकृति समथर तथा समतल भू-भागद्वारा विशेषीकृत छ। नेपाल सिमाभित्र पाइपलाइनको उचाइ प्रोफाइल ११७ देखि १४५ मिटर (समुद्री सतहबाट) को दायरा भित्र पर्दछ र समग्र मार्गमा तुलनात्मक रूपमा न्यून तथा स्थिर उचाइ कायम रहेको छ।

आयोजना क्षेत्र उष्ण जलवायु क्षेत्रमा पर्दछ, जसमा उच्च आर्द्रता तथा मनसुनी प्रभाव प्रमुख रूपमा देखिन्छ। मासिक न्यूनतम तापक्रम औसत १०°C देखि अधिकतम औसत २६°C सम्म रहन्छ भने औसत अधिकतम तापक्रम २६°C देखि ३३°C को बीचमा पाइन्छ। वार्षिक वर्षा करिब २४२६ मि.मि. रहेको छ। सबैभन्दा सुक्खा महिना (डिसेम्बर) र सबैभन्दा भिजेको महिना (जुलाई) बीच वर्षाको अन्तर (औसत ७ मि.मि. देखि ६८३ मि.मि.) देखिने हुँदा मनसुनको समयमा खाल्डोमा पानी जम्ने तथा माटो अस्थिर हुने जोखिम न्यूनीकरणका लागि निर्माण तालिका निर्धारण गर्न आवश्यक हुन्छ।

भूमि उपयोग

पाइपलाइनको मार्ग मुख्य रूपमा विद्यमान पूर्व-पश्चिम राजमार्गको अधिकारक्षेत्र भित्र गर्दछ। प्रस्तावित पाइपलाइन मार्गको ५०० मिटर बफर क्षेत्रभित्रको वर्तमान भूमि उपयोग वितरण यसप्रकार छ:

- बसोबास तथा कृषि (८४%): राजमार्ग वरपरका शहरी केन्द्र तथा गाउँ बस्तीहरू।
- वन क्षेत्र (१५%): चाराआली वन क्षेत्र।
- जलाशय तथा अन्य (१%): नदी तथा सिमसार क्षेत्रहरू।

जनसंख्या घनत्व सूचकाङ्क (Population Density Index – PDI) अनुसार आयोजना क्षेत्र ZONE III अन्तर्गत पर्दछ, जसका लागि उच्च गुणस्तरीय इस्पात तथा उन्नत सुरक्षा मापदण्डहरू आवश्यक हुन्छन्।

जल विज्ञान तथा निकास

पाइपलाइन करिडोरले मौसमी तथा सदावहार नदीहरू जस्तै मेची खोला, निन्दा खोला, टिमाई खोला, हडिया खोला, फुलवासा खोला आदिलाई प्रतिच्छेदन गर्दछ। मेची, तथा निन्दा खोलाहरू तुलनात्मक रूपमा फराकिलो र बालुवा तथा कंकरयुक्त बालुवा रहेका छन्।

नदी आकृति: मेची र निन्दा खोला अन्य खोलाहरूको तुलनात्मक रूपमा घुमाउरो (meandering) तथा नदीजन्य पदार्थ, बालुवा, ढुङ्गा, गिटी रहेको देखिन्छ भने अन्य नदीहरू तुलनात्मक रूपमा सीधा प्रवाह भएका छन्। उक्त खोलाहरूमा किनार कटान तथा भू-क्षय उल्लेखनीय रूपमा पहिचान गरिएको छैन, किनकि ति स्थानहरूमा पुल निर्माण कार्य सञ्चालनमा रहेको छ।

पाइपलाइन बिछ्याउने प्रविधि: यी खोला ऋसिडहरूमा Horizontal Directional Drilling (HDD) प्रविधि प्रयोग गरिनेछ, जसले मौसमी बाढीबाट पाइपलाइनको संरचनात्मक सुरक्षा सुनिश्चित गर्दछ।

वातावरणीय गुणस्तर

आधारभूत अनुगमनबाट निम्न अवस्था स्थापित गरिएको छ:

- वायु गुणस्तर (PM10, PM2.5, SO₂, NO₂, CO) राष्ट्रिय मापदण्डभित्र रहेको छ।
- ध्वनि स्तर दिनको समयमा सामान्य रूपमा स्वीकार्य भए पनि केही क्षेत्रमा राति समयमा सीमा भन्दा बढी पाइएको छ।
- पानीको गुणस्तर सामान्य प्रयोगका लागि उपयुक्त भए पनि खोलाको पानीमा जैविक प्रदूषणका संकेतहरू देखिएका छन्।

प्राकृतिक प्रकोप तथा भूकम्पीय जोखिम

भूकम्पीय जोखिम: पाइपलाइन मार्ग मध्यम भूकम्पीय जोखिम क्षेत्रमा पर्दछ, त्यसैले डिजाइनमा सम्भावित भूकम्पलाई ध्यानमा राखी आयोजनामा प्रयोग गरिने सामग्रीको गुणस्तर विश्लेषण समावेश गर्नुपर्ने हुन्छ।

बाढी जोखिम: मेची र निन्दा खोला क्षेत्रमा बाढी जोखिम क्षेत्रहरू पहिचान गरिएका छन्। यी क्षेत्रमा हुने नदीजन्य पदार्थको जम्मा तथा जलमार्ग परिवर्तनका कारण खोला किनारा कटान हुन सक्ने भएकाले पाइपको गहिराई पर्याप्त रूपमा र पाइपलाइनका लागि विशेष किनार संरक्षण आवश्यक हुन्छ।

जैविक वातावरण

पाइपलाइन मार्ग कुनै पनि संरक्षित क्षेत्रहरू जस्तै राष्ट्रिय निकुञ्ज, संरक्षण क्षेत्र, वन्यजन्तु आरक्ष, सिकार आरक्ष, संरक्षित वन क्षेत्रभित्रबाट जाने छैन। आयोजना क्षेत्र नजिकको वन क्षेत्र करिब ३० मि. दुरीमा चारआली वन रहेको छ। मेची राजमार्गद्वारा छुट्ट्याइएको उक्त वन र पेट्रोलियम पाइपलाइन करिब १.७ कि.मि. लम्बाइमा समानान्तर रहेको छ।

चाराली वन मुख्य रूपमा साल (*Shorea robusta*) तथा सिसौ (*Dalbergia sissoo*) वन प्रकारबाट बनेको छ, जसमा साल प्रमुख प्रजाति हो। सहायक प्रजातिहरूमा सज (*Terminalia alata*), खैर (*Acacia catechu*), सिमल (*Bombax ceiba*), सिन्दुरे (*Mallotus philippensis*), राजवृक्ष (*Cassia fistula*), बदकमले (*Caesaria glomerata*), बोटधयेरो (*Lagerstroemia parviflora*) तथा कुसुम (*Schleichera oleosa*) समावेश छन्। झाडी तहमा करी पत्ता (*Murraya koenigii*), अंगेरी (*Melastoma normale*) तथा *Clausena excavata* जस्ता प्रजातिहरू पाइन्छन्।

चाराली वन अन्य वनहरूसंग पृथक भए पनि हात्तीको अस्थायी बासस्थानका रूपमा प्रयोग हुने गरेको छ र भारतबाट जलथलसम्म आवागमन गर्ने हात्तीको समूहको लागि महत्वपूर्ण मार्गको रूपमा कार्य गर्दछ। स्थानीय जानकारी अनुसार वन्यजन्तु मार्ग भारत-बहुण्डाँगी (चुरे फेदी)-धाइजन्-चाराली-जलथल रहेको छ। कहिलेकाहीं हात्तीहरू भारतको पानीटंकीबाट साना समूह मा सिधै चाराली हुँदै जलथलसम्म पुग्ने र पुनः सोही मार्गबाट फर्कने गरेका छन्।

सामाजिक-आर्थिक तथा सांस्कृतिक वातावरण

परियोजनाले पाइपलाइन निर्माणका लागि सरकारी स्वामित्वको राजमार्ग अधिकार क्षेत्र (RoW) प्रयोग गर्ने भएकाले निजी सम्पत्तिमा प्रभाव तथा पुनःस्थापना गर्नु पर्ने आवश्यकता छैन। मार्ग आसपास १८९ घरधुरीमा गरिएको सर्वेक्षण तथा जनगणना सर्वेक्षण, २०७८ अनुसार उक्त नगरपालिकामा कुल ३२,६९५ घरधुरी रहेका छन्। आवासीय संरचना मुख्यतः स्थायी प्रकारका छन्, जहाँ २०७८ को जनगणना तथा २०२५ मा मार्ग आसपास १८९ घरधुरीमा गरिएको स्थलगत अवलोकन अनुसार ७७% भन्दा बढी घरहरू सिमेन्ट-बाँधिनेको ईटा वा ढुङ्गाबाट बनेका छन्।

मेचीनगर नगरपालिकामा प्रभावित वडाको जनसंख्या ६७,०३० रहेको छ, जसमा महिला अनुपात केही बढी छ। जनगणना सर्वेक्षण, २०७८ अनुसार बस्ती संरचना पूर्ण रूपमा शहरी (वडा नं. ६ र १०) तथा अर्ध-शहरी (वडा नं. ७, ८, १३ र १४) क्षेत्रमा विभाजित छ, ग्रामीण बस्ती नभएको पाइन्छ।

१८९ घरधुरीको विश्लेषण अनुसार आर्थिक अवस्था स्थिर देखिन्छ, जहाँ ८४% घरधुरीको मासिक खर्च ५०,००० रुपैयाँभन्दा कम छ भने २७% ले ७५,००० रुपैयाँभन्दा बढी आम्दानी गर्ने देखिन्छ, जसले वित्तीय सुदृढता तथा बचत क्षमतालाई संकेत गर्दछ।

परियोजना क्षेत्रमा हिन्दू, बौद्ध, किरात, इस्लाम तथा इसाई धर्मावलम्बीहरूको सहअस्तित्व रहेको सांस्कृतिक विविधता पाइन्छ। जातीय संरचनामा खस आर्य, राई, लिम्बु, थारु, सन्थाल तथा आदिवासी राजवंशी/धिमाल समुदायहरू समावेश छन्। दशैं र तिहारका साथै राई समुदायको उधौली-उभौली, थारु समुदायको माघी तथा गुरुड र तामाड समुदायको ल्होसार जस्ता पर्वहरूले सामाजिक जीवनलाई समृद्ध बनाएका छन्।

छ. वैकल्पिक विश्लेषण

वातावरणीय प्रभाव मूल्याङ्कनको अध्ययनमा विभिन्न विकल्पहरूको मूल्याङ्कन गरिएको थियो:

परियोजना कार्यान्वयन नगर्ने विकल्प: ट्यांकरमार्फत इन्धन ढुवानीमा निर्भरता कायम रहने, लागत वृद्धि, ट्राफिक जाम, उत्सर्जन वृद्धि, इन्धन नोक्सानी तथा आपूर्ति अवरोध हुने भएकाले अस्वीकृत गरिएको।

मार्ग विकल्पहरू:

– विकल्प १: निजी जग्गाबाट जाने छोटो मार्ग, जसले जग्गा अधिग्रहण तथा उच्च वातावरणीय र सामाजिक प्रभाव निम्त्याउँछ।

– विकल्प २ (छनोट गरिएको): विद्यमान राजमार्ग अधिकार क्षेत्र (RoW) भित्रको मार्ग, जसले विस्थापन, वातावरणीय क्षति तथा कार्यान्वयन समयलाई न्यून बनाउँछ।

छनोट गरिएको विकल्प वातावरणीय, सामाजिक तथा आर्थिक दृष्टिले सबैभन्दा उपयुक्त देखिएको छ।

ज. वातावरणीय प्रभाव तथा न्यूनीकरण उपायहरू

परियोजना कार्यान्वयनका क्रममा उत्पन्न हुने वातावरणीय प्रभावहरू तथा न्यूनीकरण उपायहरू तल उल्लेख गरिएको छ:

लाभदायक प्रभावहरू तथा लाभ अभिवृद्धि उपायहरू

निर्माण चरणमा मानवीय व्यवस्थापन र खरिद प्रक्रियामार्फत स्थानीय आर्थिक लाभलाई अधिकतम बनाउने कुरामा मुख्य ध्यान दिइनेछ। रोजगारीका अवसरहरू समुदायभित्रै रहने सुनिश्चित गर्न श्रम-आधारित निर्माण प्रविधिहरूलाई प्राथमिकता दिइनेछ, र सम्झौतामा उल्लेख भए बमोजिम कामदारहरूलाई समयमै पूर्ण पारिश्रमिक भुक्तानी गरिनेछ। प्रत्यक्ष रोजगारीका अतिरिक्त, स्थानीय आपूर्तिकर्ताहरूबाट बालुवा, गिट्टी र ईटा जस्ता आवश्यक निर्माण सामग्रीहरू खरिद गरेर र ढुवानी,

क्याटरिड तथा मर्मतसम्भारका लागि स्थानीय सेवाहरू उपयोग गरी स्थानीय उद्यमशीलतालाई प्रोत्साहित गर्ने परियोजनाको लक्ष्य रहेको छ। निर्माण शिविरहरूको उपस्थितिले आर्थिक वृद्धिको लागि उत्प्रेरकको रूपमा काम गर्नेछ, जसले स्थानीय घरधुरीको आय बढाउन निर्माण स्थलहरू नजिक साना चिया पसल, किराना पसल र रेस्टुरेन्टहरू स्थापना गर्न प्रोत्साहन गर्नेछ।

सञ्चालन चरणमा, परियोजना दक्षता, सुरक्षा र वातावरणीय दिगोपनाका लागि डिजाइन गरिएको उच्च-प्रविधि ढाँचामा प्रवेश गर्नेछ। पेट्रोलियम पदार्थको भरपर्दो प्रवाह सुनिश्चित गर्न र सडक अवरोधका कारण हुने समस्याहरू हटाउन पाइपलाइनमा स्वचालित प्रवाह नियन्त्रण, चुहावट पत्ता लगाउने प्रविधि र घर्षण कम गर्ने रासायनिक पदार्थहरूको प्रयोग गरिनेछ। पाइपलाइनको संरचनात्मक सुरक्षालाई उच्च प्राथमिकता दिइनेछ; विशेष गरी नदी र राजमार्गको जल निकासी क्रसिङहरूमा पाइपलाइनलाई पर्याप्त गहिराइमा गाडिनेछ र माटोबाट हुने क्षय रोक्न 'क्याथोडिक प्रोटेक्सन' (Cathodic Protection) प्रणालीद्वारा सुरक्षित गरिनेछ। 'फाइबर-अप्टिक सेन्सिङ' (Fiber-Optic Sensing) र नियमित स्थलगत गस्तीमार्फत वास्तविक समयमा पाइपलाइनको अनुगमन गरिनेछ।

वातावरणीय रूपमा, परियोजनाले पूर्ण रूपमा बन्द 'टर्मिनल'को माध्यमबाट हरितगृह ग्यास उत्सर्जन र ट्याङ्करको सञ्चालन खर्च घटाउने लक्ष्य राखेको छ। यस टर्मिनलमा उच्च गतिको स्वचालित लोडिङ आर्म्स र 'भेपर रिक्भरी सिस्टम' (VRS) जडान गरिनेछ, जसले इन्धन लोड गर्ने क्रममा निस्कने पेट्रोलियम वाष्पलाई संकलन गरी पुनः प्रयोग गर्नेछ। 'ग्रीनफिल्ड टर्मिनल' (GFT) को सञ्चालनमार्फत दीर्घकालीन सामाजिक-आर्थिक विकास हुनेछ, जसले सञ्चालनमा खटिने कर्मचारी र बहदो स्थानीय जनसंख्यालाई सेवा दिने होटल, आवास र किराना पसलहरू जस्ता स्थानीय व्यवसायहरूलाई निरन्तर टेवा पुऱ्याउनेछ।

पेट्रोलियम पाइपलाईन बाट पर्ने असर तथा न्यूनीकारको उपायहरू

वातावरणीय प्रभाव/समस्या	न्यूनीकरण उपायहरू
A. भौतिक तथा रासायनिक वातावरण	
I. निर्माण चरण	
विद्यमान पूर्वाधारमा सम्भावित क्षति	पेट्रोलियम पाइपलाइन खन्ने कार्य सडक बिभाग, खानेपानी उपभोक्ता समिति तथा अन्य सम्बन्धित निकायहरूसँग समन्वय गरी सञ्चालन गरिनेछ, जसले सेवा अवरोध हुनबाट जोगाउँछ। खानेपानी प्रणालीसँग सुरक्षित दूरी कायम गरिनेछ र निर्माणका क्रममा क्षति पुगेको राजमार्गलाई पहिलेको अवस्थामै पुनःस्थापना गरिनेछ।

माटो तथा उत्खनन अवशेष उत्पादन	उत्खनन तथा पुनभरण सन्तुलन विधि अपनाई उत्खनन गरिएको माटोलाई ब्याकफिलका रूपमा पुनःप्रयोग गरिनेछ। अतिरिक्त माटो भएमा टर्मिनल क्षेत्रमा सुरक्षित रूपमा व्यवस्थापन गरिनेछ र अनधिकृत फालनलाई निषेध गरिनेछ।
ध्वनि, कम्पन तथा वायु गुणस्तर हास	सबै उपकरणहरूमा ध्वनी कम गर्ने यन्त्र तथा प्राणाली जडान तथा मर्मत गरिनेछ। निर्माण कार्य दिनको समयमा मात्र सञ्चालन गरिनेछ। उच्च ध्वनि क्षेत्रमा काम गर्ने श्रमिकलाई कान सुरक्षा उपकरण अनिवार्य गरिनेछ तथा विद्यालय र अस्पताल नजिक ध्वनि अवरोधक प्रयोग गरिनेछ। पाइपलाइन खाल्डो खन्ने कार्य खण्ड-खण्डमा गरिनेछ जसले धुलो न्यून गर्छ।
नदी तथा नालाहरू ऋस गर्ने कार्य	पाइपलाइनलाई नदीमुनी गहिराइमा राख्न Horizontal Directional Drilling (HDD) प्रविधि प्रयोग गरिनेछ। मनसुन अवधिमा निर्माण कार्य स्थगित गरिनेछ।
II. सञ्चालन चरण	
पाइपलाइन क्षय तथा चुहावट	पाइपलाइनमा Cathodic Protection तथा कोटिङ प्रयोग गरिनेछ। SCADA प्रणालीद्वारा वास्तविक समयमा (real-time) निगरानी गरिनेछ। सञ्चालनअघि १२५% दबावमा हाइड्रोस्टाटिक परीक्षण गरिनेछ।
भू-प्रकोपका कारण प्रभाव	उच्च लचकता गुण भएको पाइप प्रयोग गरिनेछ। नदी क्षेत्रमा पाइपलाई अधिकतम पानीको गहिराइभन्दा ४-६ मिटर तल राखिनेछ। सेन्सर प्रणालीमार्फत भूकम्प वा दुर्घटनामा स्वचालित रूपमा इन्धन बन्द गरिनेछ।
सडक भत्कँदा पाइपलाइन उजागर हुने जोखिम	पाइपलाइन १.२-२ मिटर गहिराइमा राखिनेछ र सडक किनाराबाट सुरक्षित दूरीमा रहनेछ। जोखिमयुक्त क्षेत्रको पहिचान तथा सुरक्षाको निमित्त नियमित स्थलगत निरीक्षण गरिनेछ।
B. जैविक वातावरण	
I. निर्माण चरण	
वन्यजन्तुसँग द्वन्द्व सम्भावना	वन क्षेत्र नजिक निर्माण कार्य दिनको समयमा मात्र सञ्चालन गरिनेछ। वन प्राधिकसँग समन्वय गरी बारबन्दी प्रभावकारी रूपमा कायम गरिनेछ।
C. सामाजिक—आर्थिक तथा सांस्कृतिक वातावरण	
I. निर्माण चरण	

सडक सुरक्षा तथा ट्राफिक अवरोध	पाइप बिच्छ्याउन निर्माण गरिएको खुला खाल्डो वरिपरि चेतावनी संकेत, परावर्तनकारी टेप तथा अवरोधक राखिनेछ। सवारीको गति सीमित गरिनेछ।
श्रमिक स्वास्थ्य तथा सुरक्षा	दैनिक तथा साप्ताहिक सुरक्षा प्रशिक्षण (toolbox talks), व्यक्तिगत सुरक्षा उपकरण, उपलब्धता, प्राथमिक उपचार तथा आपतकालीन सेवा सुनिश्चित गरिनेछ। पेशागत स्वास्थ्य सुरक्षा योजना लागू गरिनेछ।
श्रमिकबीच द्वन्द्व सम्भावना	कामदारहरुलाई अभिमुखीकरण कार्यक्रम सञ्चालन गरिनेछ। गुनासो व्यवस्थापन संयन्त्र स्थापना गरिनेछ।
II. सञ्चालन चरण	
तेस्रो पक्ष हस्तक्षेप	पाइपमाथि चेतावनी टेप राखिनेछ तथा प्रत्येक १००-२०० मिटरमा मार्कर राखिनेछ। पाइपलाइन नजिकै अन्य संरचना निर्माण/उत्खननअघि नेपाल आयल निगमसंग समन्वय गर्नु पर्ने व्यवस्था गरिनेछ तथा सो स्थानमा ठुला उपकरण प्रयोग गरी गरिने कार्यलाई प्राथमिकता दिइने छैन।
पाइपलाइन सुरक्षा तथा संरक्षण	भारतीय मापदण्डअनुसार डिजाइन गरिनेछ। पाइपलाइनलाई RoW भित्र १.२ मिटर गहिराइमा राखिनेछ तथा नियमित गस्ती (patrolling) गरिनेछ।

ग्रिन फिल्ड टर्मिनल चाराली, झापा

प्रभाव/समस्या	न्यूनीकरण उपायहरू
A. भौतिक तथा रासायनिक वातावरण	
I. निर्माण चरण	
क्याम्प साइट तथा भण्डारण स्थल स्थापना	श्रमिक क्याम्प टर्मिनल क्षेत्रभित्र स्थापना गरिनेछ र स्थानीय बासिन्दाको सुरक्षा सुनिश्चित गर्न घेराबन्दी गरिनेछ। निर्माण सामग्रीहरुलाई बारले घेरी ढाकेर राखिनेछ। जोखिमयुक्त रसायनहरू निश्चित स्थानमा भण्डारण गरिनेछ।
श्रमिकद्वारा उत्पन्न फोहोर	जैविक, पुनःप्रयोगयोग्य तथा जोखिमयुक्त फोहोर छुट्याउन छुट्टा छुट्टै विनको प्रयोग गरिनेछ। स्थानीय निकायसँग सहकार्य गरी नियमित फोहोर सङ्कलन गरिनेछ र अस्थायी क्याम्प हटाउँदा सम्पूर्ण फोहोर सफा गरिनेछ।
भूमि विकास	टर्मिनल सुरक्षाको लागि ३ मिटर अग्लो पर्खाल निर्माण गरिनेछ। स्वीकृत तथा वैध रूपमा सञ्चालीत खानीबाट मात्र जमिन भरण सामग्री ल्याइनेछ।

	तहगत कम्प्याक्सन गरिनेछ। टर्मिन भित्र आन्तरिक निकास प्रणाली विकास गरिनेछ। हरित बफर क्षेत्र राखिनेछ। जमिनको माथिल्लो उर्वर माटो संरक्षण गरी पछि हरियाली विकासमा प्रयोग गरिनेछ।
प्राकृतिक निकास परिवर्तन	टर्मिनल पर्खालको बाहिर पट्टी २ मिटर चौडाइ र १-१.५ मिटर गहिराइको डाइभर्ट नाला निर्माण गरिनेछ। विद्यमान निकास प्रणालीसँग जडान गरिनेछ। टर्मिनलभित्र वर्षात पानी निकास प्रणाली विकास गरिनेछ।
टर्मिनल जमिन भरण सामग्री प्राप्ति	टर्मिनल जमिन विकासका लागि आवश्यक सामग्री स्वीकृत खानी/क्रसर उद्योगबाट मात्र ल्याइनेछ। सम्बन्धित निकायबाट अनुमति प्राप्त हुनुपर्नेछ। जमिन उकासन प्रयोग गरिने माटोको गुणस्तर इन्जिनियरद्वारा गुणस्तर परीक्षण गरिनेछ।
वायु तथा ध्वनि प्रदूषण	निर्माण सामग्री ढुवानी गर्दा प्रयोग हुने ट्रकहरू टारपोलिनले ढाकिनेछ। टर्मिनल सम्म पुग्ने पहुँच मार्ग क्षति भएमा मर्मत गरिनेछ। निर्माण स्थलमा "नो हर्न" क्षेत्र लागू गरिनेछ। DG सेट ध्वनि नियन्त्रणसहित जडान गरिनेछ।
II. सञ्चालन चरण	
टर्मिनल सुरक्षा	३ मिटर अग्लो पर्खाल, २४/७ सुरक्षा गार्ड, CCTV निगरानी तथा अधिकृत व्यक्तिलाई मात्र प्रवेश व्यवस्था गरिनेछ।
आगलागी जोखिम	OISD-STD-118 अनुसार ट्यांक दूरी निर्धारण गरिनेछ। १६ मिटर व्यास र १८.५ मिटर उचाइका दुईवटा फायर ट्यांक, फायर पम्प, फोम पम्प तथा हाइड्रेन्ट प्रणाली जडान गरिनेछ।
बाढी जोखिम	फुलबासा खोलाको बाढी विश्लेषण अनुसार टर्मिनल उचाइ निर्धारण गरिनेछ। २ मिटर चौडाइको परिधीय ड्रेनेज र आन्तरिक निकास प्रणाली विकास गरिनेछ।
माटो तथा पानी प्रदूषण	HSD तथा MS ट्यांकहरू ११०% क्षमता धारण गर्ने डाइक बालभित्र राखिनेछ। ३.५m × १.५m को तेल-पानी बिच्छेदक प्रयोग गरिनेछ। उच्च जोखिम क्षेत्रमा spill kits उपलब्ध गराइनेछ।
तेलबाट वाष्प उत्सर्जन	फ्लोटिङ रूफ ट्यांक, Vapor Recovery Unit (VRU), bottom loading प्रणाली, VOC नियन्त्रण प्रणाली तथा Leak Detection and Repair कार्यक्रम लागू गरिनेछ।

पिगिङ्ग प्रभाव	चरणबद्ध पिगिङ्ग प्रक्रिया अपनाइनेछ। वर्तमान वास्तविक-समय निगरानी प्रणाली प्रयोग गरिनेछ। बन्द प्रणालीमा सञ्चालन गरिनेछ र फोहोर राष्ट्रिय मापदण्डअनुसार व्यवस्थापन गरिनेछ।
B. जैविक वातावरण	
I. निर्माण चरण	
वन्यजन्तु तथा चराचुरुङ्गीमा प्रभाव	कर्मचारीहरूलाई वन्यजन्तु संरक्षणसम्बन्धी तालिम दिइनेछ। सिकार तथा अवैध कटानी निषेध गरिनेछ। क्याम्पमा LPG वा विद्युत् प्रयोग गरिनेछ। आगलागी नियन्त्रण उपाय अपनाइनेछ।
अवैध सिकार तथा शिकार	श्रमिकहरूलाई सिकार निषेध गरिनेछ। चेतावनी संकेत राखिनेछ। ठेकेदारले कडाइका साथ अनुगमन गर्नेछ।
II. सञ्चालन चरण	
पेट्रोलियम चुहावटबाट जैविक प्रभाव	चुहावट भएमा माटोलाई बायोडिग्रेडेसन विधिबाट उपचार गरिनेछ, जसमा जीवाणु तथा पोषक तत्त्व प्रयोग गरिनेछ।
C. सामाजिक—आर्थिक तथा सांस्कृतिक वातावरण	
I. निर्माण चरण	
आधारभूत सुविधा व्यवस्था	श्रमिक आवास, शौचालय, पानी (ट्युबवेल), बिजुली नेपाल विद्युत् प्राधिकरणबाट तथा DG ब्याकअप उपलब्ध गरिनेछ। फोहोर व्यवस्थापनका लागि छुट्याइएको डब्बा प्रयोग गरिनेछ।
श्रमिक स्वास्थ्य तथा सुरक्षा	दैनिक/साप्ताहिक सुरक्षा तालिम, PPE अनिवार्य, प्राथमिक उपचार सुविधा तथा OHS मापदण्ड पालना गरिनेछ।
ट्राफिक वृद्धि तथा दुर्घटना जोखिम	सवारी साधन अफ—पिक समयमा सञ्चालन गरिनेछ। सडक मर्मत गरिनेछ। चेतावनी संकेत राखिनेछ। प्राथमिक उपचार तालिम प्रदान गरिनेछ।
II. सञ्चालन चरण	
सामुदायिक स्वास्थ्य तथा सुरक्षा	आपतकालीन प्रतिक्रिया योजना, तथा निकास मार्ग व्यवस्था गरिनेछ। ट्यांकर सडकमा पार्किङ निषेध गरिनेछ। बफर जोन कायम गरिनेछ। गुनासोका लागि २४ घण्टा हेल्पलाइन उपलब्ध गरिनेछ।
श्रमिक स्वास्थ्य तथा सुरक्षा	जोखिम क्षेत्र वर्गीकरण गरिनेछ। PPE अनिवार्य गरिनेछ।

आगलागी नियन्त्रण	VRU प्रणाली, फायर हाइड्रेन्ट, ३७१९.६४ KL क्षमताका दुई ट्यांक, DCP तथा CO ₂ उपकरण तथा फोम टेन्डर उपलब्ध गरिनेछ।
माटो तथा पानी प्रदूषण	३५m × १५m oil-water separator, १०० KL स्लज ट्यांक तथा भू-जल अनुगमन गरिनेछ।

छ. वातावरणीय व्यवस्थापन योजना तथा वातावरणीय अनुगमन योजना

वातावरणीय व्यवस्थापन योजनामा न्यूनीकरण उपायहरू, तिनको कार्यान्वयनको समय र स्थान, लागत तथा जिम्मेवार निकायहरू र अनुगमन गर्ने संयन्त्रहरूको विस्तृत विवरण समावेश गरिएको छ। साथै, वातावरणीय व्यवस्थापन योजनाको प्रभावकारी कार्यान्वयन सुनिश्चित गर्न आवश्यक अनुगमन क्रियाकलापहरूलाई मार्गदर्शन गर्ने उद्देश्यले वातावरणीय अनुगमन योजना तयार गरिएको छ।

नेपाल आयल निगम/ सिलिगुरी-झापा पेट्रोलियम पाइपलाइन परियोजना एकाइ वातावरणीय व्यवस्थापन योजनाको कार्यान्वयन निकाय हुनेछ र परियोजनाअन्तर्गत वातावरणीय सुरक्षाका सम्पूर्ण उपायहरूको समग्र कार्यान्वयनको जिम्मेवारी वहन गर्नेछ।

परियोजनाका भौतिक, जैविक, सामाजिक—आर्थिक तथा सांस्कृतिक वातावरणमा पर्ने प्रभाव न्यूनीकरण तथा सकारात्मक प्रभाव अभिवृद्धि उपायहरूको लागत रु. ४,२०५,००० अनुमान गरिएको छ। त्यस्तै, वातावरणीय अनुगमनका लागि रु. १६,६०,००० प्रस्ताव गरिएको छ।

ज. गुनासो सुनुवाइ संयन्त्र

सरोकारवालाहरूका गुनासाहरू समाधान गर्न चार तहको संयन्त्र स्थापना गरिएको छ:

१. स्थल स्तर: ठेकेदार तथा साइट कार्यालयद्वारा तत्काल समाधान।
२. परियोजना स्तर: परियोजना कार्यान्वयन एकाइ (PIU) मा मुद्दा पठाइने।
३. विभागीय स्तर: गुनासो समाधान समितिद्वारा समीक्षा।
४. न्यायिक स्तर: आवश्यक परेमा कानुनी प्रक्रिया अपनाउन सकिने।

यस संयन्त्रले पारदर्शिता, उत्तरदायित्व तथा समुदायको सहभागिता सुनिश्चित गर्दछ।

झ. वातावरणीय परीक्षण

वातावरणीय प्रभाव अडिट परियोजना सम्पन्न भएको दुई वर्षपछि सञ्चालन गरिनेछ, जसद्वारा वास्तविक वातावरणीय प्रभाव, न्यूनीकरण तथा अभिवृद्धि उपायहरूको प्रभावकारिता र अनुगमन प्रणालीको कार्यक्षमता मूल्याङ्कन गरिनेछ।

अडिट कार्य नेपाल सरकार वन तथा वातावरण मन्त्रालय वा तोकिएको निकायद्वारा सञ्चालन गरिनेछ।

ज. निष्कर्ष

सिलिगुरी-झापा पेट्रोलियम पाइपलाइन एक महत्वपूर्ण अन्तरदेशीय नेपाल सरकार र भारत सरकारको सरकार-सरकार परियोजना हो, जसले भारतको सिलिगुरी टर्मिनललाई नेपालको चारआली स्थित १८,९०० किलोलीटर क्षमताको ग्रीन फिल्ड टर्मिनलसँग जोड्दछ। कुल ४९.६ कि.मी. लम्बाइमध्ये करिब १४.६ कि.मी. नेपालभित्र पर्दछ। पाइपलाइनलाई मुख्यतः पूर्व-पश्चिम राजमार्ग तथा मेची राजमार्गको अधिकार क्षेत्र भित्र भूमिगत रूपमा स्थापना गरिनेछ, जसले जग्गा अधिग्रहण तथा वातावरणीय प्रभावलाई न्यून बनाउँछ।

ट्यांकरमार्फत इन्धन ढुवानी प्रणालीको विकल्पका रूपमा यस परियोजनाले ऊर्जा सुरक्षा सुदृढ गर्नुका साथै ढुवानी यातायात भीड, उत्सर्जन तथा इन्धन नोक्सानी घटाउँछ। वातावरणीय प्रभाव मूल्याङ्कन अनुसार पाइपलाइन मार्ग वन क्षेत्रभन्दा बाहिरबाट गएको छ र निर्माण चरणका प्रभावहरू (धुलो, ध्वनि, उत्खनन) अस्थायी हुनेछन्। खोला तथा सडक क्रसिङहरूमा Horizontal Directional Drilling (HDD) प्रविधि प्रयोग गरिनेछ। सञ्चालन चरणमा, उन्नत चुहावट पहिचान प्रणाली, अप्टिकल फाइबर निगरानी तथा अग्नि सुरक्षा प्रणालीमार्फत जोखिम न्यून गरिनेछ। वातावरणीय प्रभाव मूल्याङ्कन अनुसार परियोजनाका पहिचान गरिएका नकरात्मक प्रभावहरूको व्यूनीकरणका उपायहरू अवलम्बन गरे आर्थिक तथा उर्जा सुरक्षासम्बन्धी लाभहरू यसको वातावरणीय नकरात्मक प्रभावहरूभन्दा उल्लेखनीय रूपमा बढी छन्।

ट. प्रतिबद्धताहरू

- नेपाल आयल निगमले वातावरण व्यवस्थापन योजना अन्तर्गतका न्यूनीकरण तथा अनुगमन उपायहरू कार्यान्वयन गर्नेछ।
- नदी/खोला, संवेदनशिल क्षेत्रहरू तथा आवश्यकता अनुसार trenchless HDD प्रविधि प्रयोग गरिनेछ।
- प्रभावित भूमि तथा क्षति भएको सडक भाग तुरुन्त पुनःस्थापना गरिनेछ।
- तेल चुहावट तथा आपतकालीन व्यवस्थापनका लागि समग्र कार्ययोजना लागू गरिनेछ।
- स्वास्थ्य, सुरक्षा तथा यातायात व्यवस्थापनसम्बन्धी मापदण्डहरू पालना गरिनेछ र आयोजना सँग सम्बन्धित निकायहरू सँग निरन्तर समन्वय कायम गरी आयोजना कार्यान्वयन गरिनेछ।

CONTENTS

EXECUTIVE SUMMARY OF EIA REPORT	ii
कार्यकारी सारांश	viii
LIST OF TABLES	viii
LIST OF FIGURES	ix
ABBREVIATION/ACCROMYMS	xi
CHAPTER 1: NAME AND ADDRESS OF THE ORGANIZATION PREPARING THE REPORT	1
1.1 Proponent.....	1
1.2 Consultant	1
1.3 Rationale for Environmental Impact Assessment.....	1
1.4 Objective of Environmental Impact Assessment.....	2
1.5 Scope of the Study and Other Related Matters	2
1.5.1 Scope of the EIA study	2
1.5.2 Limitation of the EIA study	3
CHAPTER 2: INTRODUCTION OF THE PROPOSAL.....	4
2.1 Background.....	4
2.2 Introduction of the Proposal.....	4
2.3 Relevancy of the Project	4
2.4 Type and Nature of the Project	5
2.5 Components and location of the Project	5
2.5.1. Petroleum Pipeline	5
2.5.2 Green Field Terminal.....	7
2.5.3 Salient Features of the Project	9
2.5.4 Safety and Security System	10
2.6 Code and Standards related to the Project	14
2.7 Petroleum pipe laying Methodology.....	14
2.8 Project Activities.....	15
2.8.1 Pre-Construction	15
2.8.2 During Construction.....	15
2.8.3 During Post-construction and Operation	16
2.9 Requirements for the Project	17
2.9.1 Land Area.....	17
2.9.2 Type of Land.....	17
2.9.3 Construction Materials and quality	17
2.9.4 Energy and Carbon Footprint.....	17
2.9.5 Human Resource.....	18
2.9.6 Water Supply for the Project.....	18

2.9.7 Construction Camp and Material Storage Site.....	19
2.9.8 Muck Management	19
2.9.9 Technologies and Machinery Equipment	19
2.9.10 Estimated Waste Generation	20
CHAPTER 3: METHODOLOGY ADOPTED FOR PREPARING THE EIA REPORT... 21	
3.1 Literature Review.....	21
3.1.1 Physical Environment	21
3.1.2 Biological Environment.....	21
3.1.3 Socio-Economic and Cultural Environment	22
3.2 Preparation of Scoping Document (SD) and Terms of Reference (ToR).....	22
3.3 Determination of the Project's Impact Area.....	22
3.3.1 Direct Impact Area (DIA).....	22
3.3.2 Indirect Impact Area (IIA).....	22
3.3.3 Zone of Influence	23
3.4 Field Observation and Data Collection.....	23
3.4.1 Physical Environment	23
3.4.2 Biological Environment	26
3.4.3 Socio-economic and Cultural Environment.....	27
3.5 Analysis of Acquired Data.....	27
3.6 Project's Impact Evaluation and Prediction.....	28
3.6.1 Evaluation of Impacts	28
3.6.2 Determination of significance of the Impact	29
3.7 Public Hearing and Public Notice.....	29
3.8 Recommendation Letter.....	30
3.9 Final Report Preparation.....	30
CHAPTER 4: REVIEW OF POLICIES, ACTS, RULES, DIRECTIVES, AND STANDARDS 31	
4.1 Constitution of Nepal.....	31
4.2 Environmental Policies and Strategies.....	31
4.3 Acts	33
4.4 Rules and Regulations.....	39
4.5 Environmental Directives, Procedures, and Guidelines and Standards	43
4.6 International Conventions.....	46
CHAPTER 5: EXISTING ENVIRONMENTAL CONDITIONS..... 48	
5.1 Physical Environment	48
5.1.1 Physiography.....	48
5.1.2 Topography	48
5.1.3 Land Use pattern	50
5.1.4 Air Environment.....	52
5.1.5 Hydrology and Drainage.....	55

5.1.6 River Morphology and Embankment Erosion	56
5.1.7 Geological Condition and Soils	57
5.1.8 Crossings across the pipeline alignment	57
5.1.9 Air Quality	58
5.1.10 Noise Level.....	59
5.1.11 Water Quality.....	60
5.1.12 Traffic Volume and Composition	63
5.1.13 Drainage and Stream near to the GFT	63
5.1.14 Seismic Risk.....	64
5.1.15 Flood	65
5.1.16 Waste management	66
5.1.17 Ancillary Facilities.....	66
5.1.18 Other Sensitive Places.....	66
5.2 Biological Environment	66
5.2.1 Forest and Forest Types	66
5.2.2 Flora	68
5.2.3 Fauna.....	72
5.2.4 Wildlife Corridor and Human Wildlife Conflict	73
5.2.5 Protected Species found around the project area	74
5.3 Socio-economic and Cultural Environment	75
5.3.1 Nearby Settlements	75
5.3.2 Population of Project Affected Municipality.....	75
5.3.3 Types of House	76
5.3.4 Literacy	76
5.3.5 Cast	77
5.3.6 Status of Urbanization.....	77
5.3.7 Occupation	78
5.3.8 Drinking Water Sources.....	78
5.3.9 Income and Saving.....	79
5.3.10 Health and Sanitation.....	79
5.3.11 Historical and Cultural Sites	80
5.3.12 Festivals and Other Rituals	81
CHAPTER 6: ALTERNATIVE ANALYSIS	82
6.1 Project no Implementation.....	82
6.2 Other Possible Alternatives.....	82
6.2.1 Alignment Alternatives.....	82
6.2.2 Pipeline Design and Technology	85
CHAPTER 7: ENVIRONMENTAL IMPACTS OF PROJECT.....	86
7.1 Beneficial Impacts	86
7.1.1 Construction Phase.....	86

7.1.2 Operation Phase	86
7.2 Adverse Impacts.....	88
7.2.1 Petroleum Pipeline	88
7.2.2 Green Field Terminal.....	92
CHAPTER 8: ENVIRONMENTAL IMPACTS MANAGEMENT MEASURES	97
8.1 Beneficial Impact Augmentation Measures	97
8.2 Adverse Impact Mitigation Measures	101
8.2.1 Petroleum Pipeline	102
8.2.2 Green Field Terminal.....	112
8.3 Environmental Management Plan.....	125
8.3.1 EMP for the Petroleum Pipeline	125
8.3.2 EMP for the Green Field Terminal	133
8.4 Summary of Estimated Costs.....	146
8.5 Working Procedure on India Nepal Border	147
8.6 Social Action Plan.....	147
8.7 Occupational Health and Safety Management Plan.....	147
8.8 Handling and Storage of Hazardous Chemical	148
8.9 Permits and Approval Plan	148
8.10 Demobilization and Rehabilitation Management Plan	148
8.11 Environmental Management Unit.....	148
8.12 Reporting Requirements	149
CHAPTER 9: ENVIRONMENTAL MONITORING.....	150
9.1 Types of Monitoring	150
9.1.1 Baseline Monitoring.....	150
9.1.2 Impact Monitoring	150
9.1.3 Compliance Monitoring	150
9.2 Environmental Monitoring Indicators.....	151
9.3 Monitoring Methodology.....	151
9.4 Monitoring Schedule.....	151
9.4 Institutional Framework for Monitoring.....	159
9.5 Grievance Redress Mechanism.....	160
9.6 Estimated Cost for Environmental Monitoring.....	161
CHAPTER 10: ENVIRONMENTAL AUDITING.....	162
10.1 Objective of Environmental Auditing.....	162
10.2 Auditing Parameters, Methods and Indicators.....	162
10.3 Content of the Environmental Audit Report.....	163
10.4 Estimated Environmental Audit Cost	164
CHAPTER 11: CONCLUSION AND COMMITMENTS.....	165
11.1 Conclusion	165
11.2 Commitments.....	166

REFERENCES..... 167
ANNEX 170
Annex I: Public Hearing Notice..... 171
Annex II: 7-Day Public Notice 173

LIST OF TABELS

Table 2-I: List of facilities at Jhapa GFT	8
Table 1-II: Details of the tanks for storage	9
Table 2-III: Salient Features of Project	9
Table 2-IV: Project related Standards	14
Table 2-V: Fuel Rrequired and carbon emission during construction	17
Table 2-VI: Human resources involve in Project.....	18
Table 2-VII: Water supply for the project.....	18
Table 2-VIII: Machinery Equipment/Technologies required for project	19
Table 2-VIII: Estimated Waste and their management	20
Table 3-I: Details of Topographic Maps of Project Area.....	21
Table 3-II: Factors considered for DIA calculation	22
Table 3-III: Factors considered for IIA calculation	23
Table 3-IV: Meteorological Data Stations	24
Table 3-V: Air Quality Sampling Location.....	24
Table 3-VI: Details of Noise Level monitoring locations	25
Table 3-VII: Soil sampling details	25
Table 3-VIII: Impact rating criteria.....	28
Table 3-IX: Determination of Level of Significance	29
Table 3-X: Public Hearing Details	29
Table 5-I: Land use pattern	51
Table 5-II: Land use along the pipeline alignment	51
Table 5-III: Wind Characteristics.....	54
Table 5-IV: Rivers across the Petroleum pipeline alignment.....	55
Table 5-V: Air Quality Status	58
Table 5-VI: Representative Noise Level of the Project area.....	59
Table 5-VII: Water Quality Status of Ground Water	60
Table 5-VIII: Water Quality Status of Stream/River Water.....	62
Table 5-IX: Traffic volume and composition	63
Table 5-X: Tree species found around the project area.....	68
Table 5-XI: List of NTFP found around the project area.....	69
Table 5-XII: List of medicinal plants found around the project area.....	71
Table 5-XIII: List of Invasive species around the project area	71
Table 5-XIV: List of mammals	72
Table 5-XV: Aves found around the project area	72
Table 5-XVI: List of reptiles and amphibians.....	73
Table 5-XVII: List of fieshes found in rivers.....	73
Table 5-XVIII: Nearby settelments along the pipeline	75
Table 5-XIX: Population Distribution in Mechinagar Municipality	75

Table 5-XX: Types of house	76
Table 5-XXI: Educational status of the sampled population	76
Table 5-XXII: Population distribution as per the urbanization	77
Table 5-XXIII: Drinking water source.....	78
Table 5-XXIV: Average income and expenditure of the sampled household.....	79
Table 5-XXV: Types of toilet	79
Table 5-XXVI: List of cultural sites near to the pipeline.....	80
Table 5-XXVII: Ethnic groups and their festivals and traditions	81
Table 6-I: Comparison of two different alignment alternatives	83
Table 6-II: Alternative analysis within the RoW of Highway	84
Table 8-I: Augmentation Measures for Beneficial Impacts	97
Table 8-II: Mitigation Measures of Adverse Impacts for Pipeline Component.....	102
Table 8-III: Mitigation Measures of Adverse Impacts.....	112
Table 8-IV: Environment Management Plan for the Petroleum Pipeline	125
Table 8-V: EMP for the Green Field Terminal	133
Table 8-VI: Environmental Impact Enhancement and Mitigation cost of SJPL Project	146
Table 9-I: Monitoring Plans and Schedule.....	152
Table 9-II: Monitoring agencies and their responsibilities	159
Table 9-III: Estimated cost for environmental monitoring	161
Table 10-I: Environment audit parameters.....	162
Table 10-II: Contents of the Environmental Audit	163

LIST OF FIGURES

Figure 2-I: Project located municipality on Nepal's map	6
Figure 2-II: Project location on Mechinagar Municipality Map	6
Figure 2-III: Petroleum pipeline alignment.....	6
Figure 2-IV: Schematic diagram of Petroleum Pipeline alignment	7
Figure 2-V: Location of GFT on Google Earth.....	7
Figure 2-VI : Nearer view of GFT on Google Earth.....	7
Figure 2-VII: Schematic diagram of VRS.....	13
Figure 3-I : Water Sampling Locations.....	25
Figure 5-I: Elevation profile of Mechinagar Municipality.....	48
Figure 5-II: Pipeline Alignment on Topo Map	49
Figure 5-III: Elevation profile of pipeline alignment.....	49
Figure 5-IV: Landuse Pattern of Project Area	50
Figure 5-V: Monthly Humidity of Project area	52
Figure 5-VI: Five year Monthly Temperature.....	53
Figure 5-VII: Monthly Average Rainfall	53

Figure 5-VIII: Air Rose Diagram of Project Area	55
Figure 5-IX: Rivers across the pipeline alignment.....	56
Figure 5-X: Geological map of project area.....	57
Figure 5-XI: Crossing across the petroleum pipeline alignment.....	58
Figure 5-XII: Air and Noise Quality Measuring Stations	60
Figure 5-XIII: Jhapa Charali Green Field Terminal.....	64
Figure 5-XIV: Seismic zoning of project area.	65
Figure 5-XV: Flood Probability map with 50-yrs return of period.....	65
Figure 5-XVI: The sensitive places.....	66
Figure 5-XVII: Charali Forest Block and proposed GFT	67
Figure 5-XVIII: Pipeline alignment along the Mechi Highway.....	68
Figure 5-XIX: Fencing for wildlife along the Forest Edge of the Mechi Highway	74
Figure 5-XX: Population by cast in Mechinagar Municipality	77
Figure 5-XXI: Occupational distribution of surveyed households	78
Figure 5-XXII: Temples near to the pipeline route.....	81
Figure 6-I: Pipeline alignment alternatives	84
Figure 8-I Environment Management Unit.....	149
Figure 9-I: Grievance redress mechanism of project	161

ABBREVIATION/ACCROMYMS

amsl	Above mean sea level
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
BOD	Biological Oxygen Demand
BS	Bikram Sambat
CBD	Convention on Biological Diversity
CCTV	Closed Circuit Television
CF	Community Forest
CFUG / CFUGs	Community Forest Users' Group
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
CP	Cathodic Protection
CR-IFR	Cone Roof-Internal Floating Roof
CRVT	Closed Roof Vapor Tight
DAO	District Administrative Office
DCC	District Coordination Committee
DFO	Division Forest Office
DG	Diesel Generator
DHM	Department of Hydrology and Meteorology
DIA	Direct Impact Area
DO	Dissolved Oxygen
DoR	Department of Roads
EIA	Environmental Impact Assessment
EMP	Environment Management Plan
EMU	Environmental Management Unit
EPA	Environment Protection Act
EPR	Environment Protection Rules
ERT	Electrical Resistivity Tomography or Emergency Response Team
FGD	Focus Group Discussion
GIS	Geographical Information System
GoI	Government of India

GoN	Government of Nepal
GPS	Global Positioning System
GRU	Grievance Redress Unit
HDD	Horizontal Directional Drilling
HDPE	High Density Polythene lined Pipe
HHs	Households
HSD	High Speed Diesel
IIA	Indirect Impact Area
ILO	International Labour Organization
IOC	Indian Oil Corporation
IUCN	International Union for Conservation of Nature
KI / KII	Key Informant or Key Informant Interview
KL	Kilo Leter
LPG	Liquefied Petroleum Gas
MBF	Main Boundary Fault
MBT	Main Boundary Thrust
MCT	Main Central Thrust
MOFAGA	Ministry of Federal Affairs and General Administration
MoFE	Ministry of Forests and Environment
MoICS	Ministry of Industry, Commerce and Supplies
MS	Microsoft
MUT	Mechanized Ultrasonic Testing
NAAQS	National Ambient Air Quality Standards
NBS	Nepal Biodiversity Strategy
NDT	Non Destructive Testing Method
NGO	Non-governmental Organization
NNQS	National Noise Quality Standards
NOC	Nepal Oil Corporation Limited
NTFPs	Non-Timber Forest Products
OHS	Occupational Health Safety
OISD	Oil Industry Safety Directorate
OWS	Oil Water Seperator
PDI	Population Density Index
PMO	Project Manager Office

PPE	Personal Protective Equipment
QC	Quality Control
RCC	Reinforced Concrete Cement / Reinforced Cement Concrete
RoW	Right-of-Way
RT	Radiographic testing
SD	Scoping Document
TLF	Truck Loading Facility
ToR	Terms of Reference
TSP	Total Suspended Particulate
TSPM	Total Suspended Particulate Matter
TSS	Total Suspended Solids
TT	Tank Trunk
WHO	World Health Organization
Units	
°C	Degree Centigrade or Degree Celsius
ha / Ha	Hectare
km / KM	Kilometer
km ²	Square kilometer
KPAs	Kilopascals Allowable Strength
kw / Kw	Kilowatt
kwh	Kilo watt hour
M	Meter
m ³ /s	Cubic Meter per Second
masl	Meter Above Sea Level
MCM	Million Cubic Meters
Mm	Millimeter
MT	Metric Ton

CHAPTER 1: NAME AND ADDRESS OF THE ORGANIZATION PREPARING THE REPORT

1.1 Proponent

The proponent of the Environmental Impact Assessment (EIA) study of the Siliguri-Jhapa Petroleum Pipeline (SJPL) and Jhapa Green Field Terminal (GFT) is Nepal Oil Corporation (NOC). Nepal Oil Corporation Limited (NOC), an undertaking of the Government of Nepal, was established on 26th Poush, 2027 B.S. (1943 AD). Nepal Oil Corporation is fully owned by the Government of Nepal. It is in charge of importing, transporting, storing, and selling petroleum products in Nepal. The main office of the corporation is located in Teku, Kathmandu. Corporation (NOC) is the company responsible for bringing in and distributing oil products throughout the country.

Full Address of the Proponent:

Name:	Nepal Oil Corporation Limited (NOC)
Address:	Babarmahal, Kathmandu, Bagmati, Nepal
Phone:	+977 01 4274974
Email:	info@noc.org.np
Web:	www.noc.org.np

1.2 Consultant

The preparation of this Environmental Impact Assessment (EIA) report has been undertaken by Redknot Engineering Consultant Pvt. Ltd., the environmental consultancy firm formally commissioned by the project proponent. Redknot Engineering Consultant Pvt. Ltd. is responsible for the baseline data collection, and the formulation of the Environmental Management Plan (EMP).

The consultant's official contact and correspondence details are as follows:

Name:	Redknot Engineering Consultant Pvt. Ltd.
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1.3 Rationale for Environmental Impact Assessment

According to Sub-section 30 of Section (J) of Schedule-3 {(अनुसूची ३ (ज) उद्योग क्षेत्र (३०))} under Rule 3 of the Environmental Protection Regulations, 2077 (2020 AD), it is mandatory to conduct an Environmental Impact Assessment (EIA) for a proposed petroleum pipeline construction project. Additionally, in accordance with the provisions of the Environmental Protection Act, 2019, the Environmental Protection Regulation, 2020, and other relevant laws, it is necessary to assess the environmental impact of the proposed project.

This project is governed by a government-to-government Memorandum of Understanding (MoU) between India's Ministry of Petroleum and Natural Gas and Nepal's Ministry of Industry, Commerce and Supplies and followed by a business-to-business framework agreement between IOC and NOC. The primary funding comes from the Government of India, provided through the Indian Oil Corporation (IOC), which covers the construction of the pipeline and a new storage terminal in Jhapa and provide all necessary technical expertise and resource for design, construction, and operational phase of the project. The Rule 7 (8) of EPR has stated that in case of a proposal foreign investment, the environmental study reports, scoping, and term of reference report can be prepared in English Language. So, as stipulated in Rule 7 (8) of EPR, this final EIA report is prepared in the English language, with an executive summary provided in Nepali.

1.4 Objective of Environmental Impact Assessment

The main objective of the EIA is to identify the impacts on physical, chemical, biological, social, economic and cultural environmental aspects on the project location and further to identify methods to enhance the positive impacts and eliminate or mitigate the negative impacts to acceptable label. Other objectives of the EIA are:

- To Collect the baseline information on physical, biological, socio-economic and cultural environment in the project affected areas,
- To identify and positive and negative environmental impacts during construction as well as operational phase of the project that help us make assumptions on the quantity, quality and durations of those impacts
- To conduct public consultations, hearing, discussions and interactions with local people and other related stakeholders to collect their grievances/suggestions,
- To propose practical and site-specific mitigation measures for adverse impacts and enhancement of positive impacts,
- To identify methods/ways to enhance positive impact and eliminate/mitigate negative impacts
- To prepare Environmental Management Plan (EMP) and Monitoring Plan during project construction and operational phase.
- To define the institutional framework required for the implementation and monitoring of the programs.

1.5 Scope of the Study and Other Related Matters

1.5.1 Scope of the EIA study

The general scope of the EIA covers all the activity that are carried out during the study. The following categories are covered:

- Literature review;
- Baseline data acquisition;
- Prediction and evaluation of potential impacts;

- Determination of appropriate mitigation measures;
- Environmental management plan;
- Consultation/stakeholder engagement;
- Report preparation.

1.5.2 Limitation of the EIA study

The proposed Petroleum Pipeline Project is a linear infrastructure development with potential environmental impacts assessed across two distinct zones: a Direct Impact Zone, defined as a 100-meter buffer radius from the pipeline alignment, and an Indirect Impact Zone, extending an additional 500 meters beyond that boundary to account for secondary influences. In accordance with the Environment Protection Rules (2020), potential adverse effects on the physical, chemical, biological, socio-economic, and cultural environments were evaluated based on their location, magnitude, extent, and duration.

However, the baseline data for this Environmental Impact Assessment (EIA) were collected through single-season sampling and a one-time field visit, which inherently lacks data on seasonal variations. Due to these time constraints and minimal direct observations of aquatic and herpetofauna during the site visit, species diversity findings were supplemented with secondary research. The impact due to the off-project activities are not considered. While necessary prevention and mitigation measures have been recommended, they are primarily based on the professional judgment and experience of the involved experts; as is common with standard EIA methodologies, this introduces a degree of subjectivity to the study's final conclusions.

CHAPTER 2: INTRODUCTION OF THE PROPOSAL

2.1 Background

Petroleum products are very important for today's world and the global economy. They are used in many industries and in our everyday lives. Nepal does not produce its own oil and depends entirely on other countries for its petroleum needs. The Nepal Oil Corporation (NOC) is the company responsible for bringing in and distributing these oil products throughout the country. Right now, Nepal gets all its petroleum products from India.

Currently, 131 km petroleum pipeline from Motihari to Amlekhganj has been built, allowing petroleum products to be imported through it. This has helped reduce transportation costs and improve the quality of petroleum products for consumers. Plans are underway to extend the pipeline to Amlekhganj - Chitwan and Siliguri - Charali. Initial preparations have also begun for the construction of a petroleum pipeline between India and Nepal.

2.2 Introduction of the Proposal

The primary purpose of the petroleum pipeline project is to transport petroleum products from Siliguri, India to Jhapa, Charali, Nepal. This is significant because it will likely provide a more efficient, reliable, and potentially cost-effective way to import fuel in Nepal. This project will also establish a terminal with 18900 KL storage capacity in Nepal, which enhances the nation's fuel security.

Regarding the SJPL Project, Indian Oil oversee and manage the construction of the petroleum pipeline and Jhapa Terminal facilities, including all engineering, procurement, and construction activities and providing the necessary technical expertise and resources throughout the project.

NOC is responsible for acquiring the necessary land for the construction of the SJPL and Jhapa Terminal and all statutory approvals and clearances, without incurring any additional costs to the Government of Nepal or Indian Oil. Furthermore, NOC will obtain all required regulatory and statutory approvals for the project within Nepalese territory from the relevant governmental authorities and will provide additional security for the pipeline, personnel, and construction equipment during the project's execution, in accordance with Nepalese law, through the appropriate Nepalese governmental bodies.

2.3 Relevancy of the Project

The final outcome of the proposed petroleum pipeline and green field terminal construction will be in ensuring regular and smooth supply of fuels which are known to be disrupted by recurring road blocks and strikes. The pipeline is also expected to reduce transportation costs by 40-50 percent, control leakage and ensure hassle-free transfer and quality of petroleum products. Transportation of petroleum products using a pipeline will significantly reduce

adulteration, and other technical losses on its way ensuring a reliable supply of petroleum products to the dealers and consumers.

2.4 Type and Nature of the Project

The project aims construction of a 49.6 KM petroleum pipeline, with 36 KM located in India and 14.6 km in Nepal, connecting the Indian Oil Siliguri Terminal in India to Charali, Jhapa, in Nepal. This project is meant only for transportation of petroleum products – Diesel, petrol and Kerosene depending on the demand, from Siliguri in India to the GFT, Charali, Jhapa at depot in Nepal through underground pipeline. The pipeline would be underground at minimum depth of 1.2 m. depending upon the site condition. A key component is the construction of receipt facilities at Jhapa Terminal, featuring a total storage capacity of 18,900 KL for Motor Spirit (MS) and High-Speed Diesel (HSD), along with an 8-bay TLF shed with bottom loading facilities and provisions for future expansion. The Horizontal Direction Drilling (HDD) and excavation methods will be used according to the site condition. The project also involves laying optical fiber cable for telecommunications and ensuring pipeline safety, and the installation of control systems, fire-fighting capabilities, security measures, and other essential infrastructure.

2.5 Components and location of the Project

The spatial extent of the project lies within the Mechinagar Municipality of Jhapa District, Koshi Province. The petroleum pipeline enters in Nepal near the Mechi Bridge, Kakarbhitta and terminates at the Green Field Terminal, Charali, Jhapa. The project has two major components viz. construction of petroleum pipeline and construction of Green Field Terminal (GFT) at Charali, Jhapa.

2.5.1. Petroleum Pipeline

The total length of the Siliguri-Jhapa Petroleum Pipeline (SJPL) is approximately 49.6 kilometers, of which approximately 14.6 kilometers fall within the territory of Nepal. The proposed pipeline route enters Nepal along the Mechi Bridge from India and proceeds along the southern Right of Way (RoW) of the East-West Highway. It subsequently follows the Mechi Highway's RoW from Charali to the Green Field Terminal. The pipeline runs within the Right of Way (RoW) of the East-West Highway (Mechi to Charali) for a length of 11.736 km and the Mechi Highway (Bhadrapur-IIam) for 1.706 km. The proposed pipeline traverses through wards 6, 7, 8, 10, 13, 14 of Mechinagar Municipality, Jhapa.

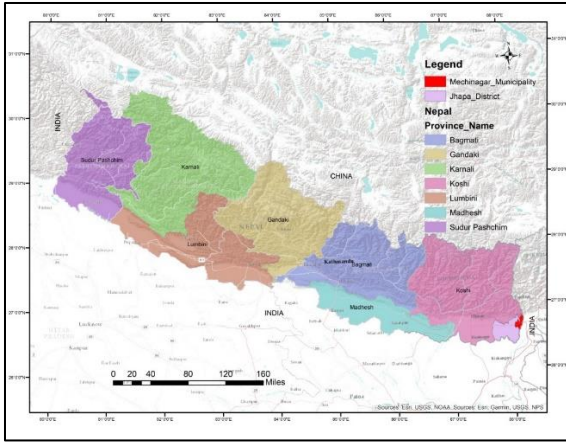


Figure 2-I: Project located municipality on Nepal’s map

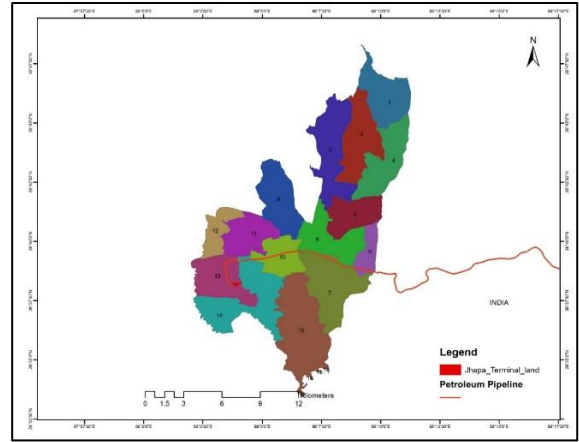


Figure 2-II: Project location on Mechinagar Municipality Map

The designated RoW for the East-West Highway (H1) spans 50 meters, comprising 25 meters on either side of the centerline. Similarly, the RoW for the Mechi Highway extends 30 meters, with 15 meters on each side of the centerline. The petroleum pipeline will be laid within the 2-3M from encroached free ROW edge of the East-West Highway on southern edge and within the 2-3 meter from encroached free ROW of the Mechi Highway on eastern side.

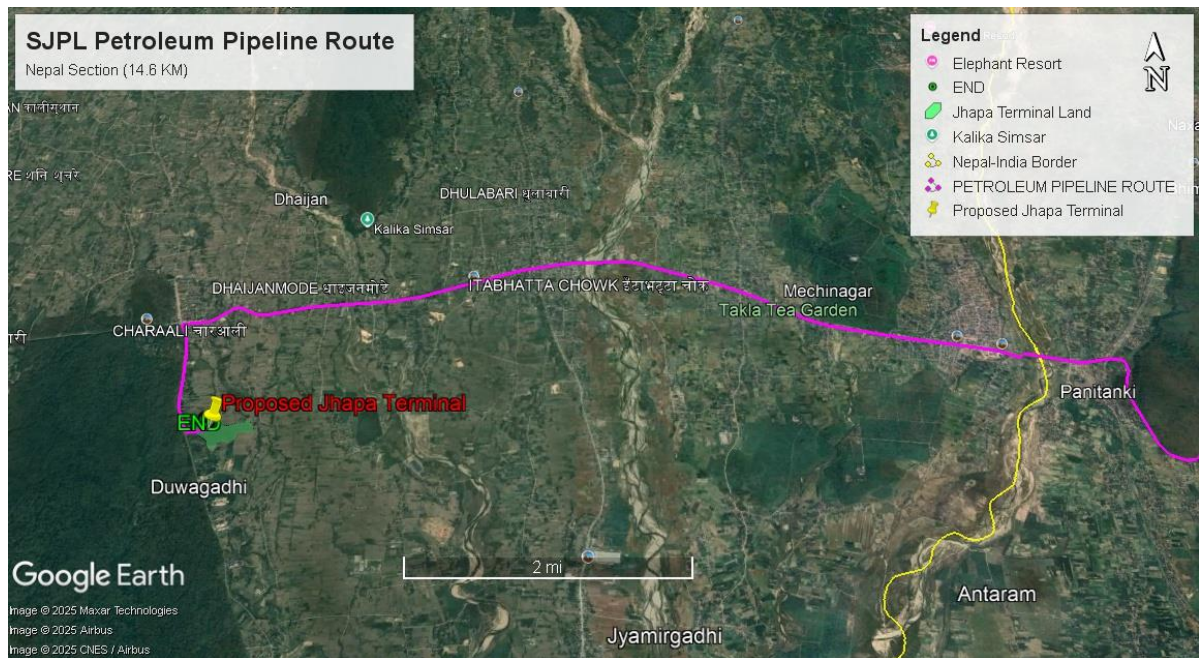


Figure 2-III: Petroleum pipeline alignment
Source: Google Earth (Retrieved on 14 Jan, 2026)

The pipeline alignment entirely lies within the Right of Way (RoW) of the East-West Highway and the Mechi Highway, both of which are under the jurisdiction of the Department of Roads, Government of Nepal. Since, the proposed route utilizes existing government-owned highway corridors, there is no requirement for land acquisition for the petroleum pipeline installation.

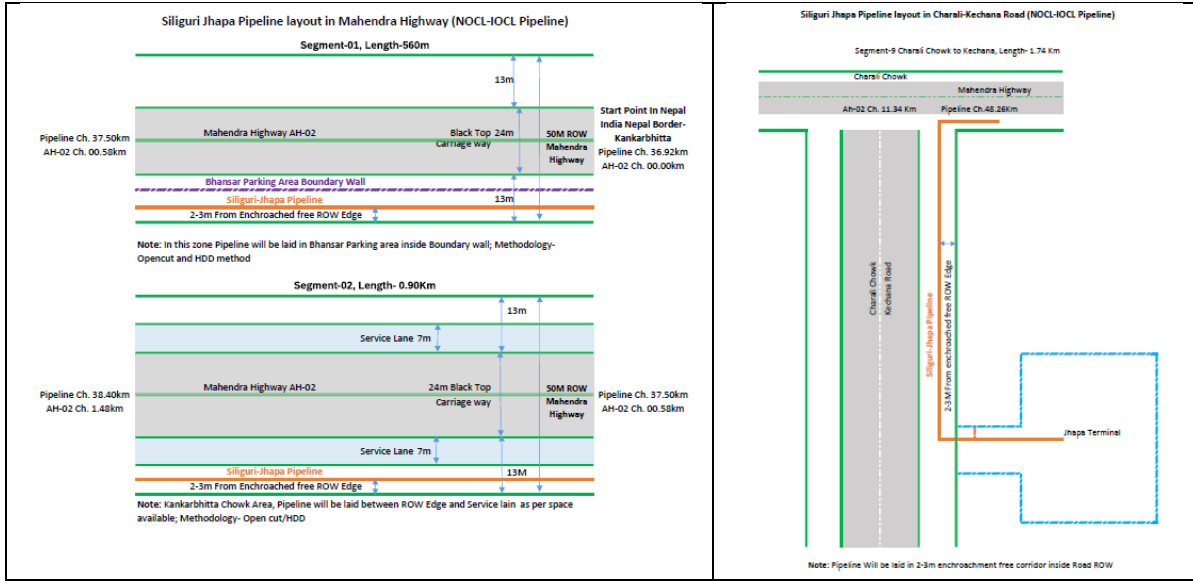


Figure 2-IV: Schematic diagram of Petroleum Pipeline alignment

Pipeline Type:

Pipeline and associated facilities shall be constructed in accordance with American Society of Mechanical Engineers ASME B 31.4 and other applicable American Petroleum Institute (API) standards. Welding shall be carried out as per API 1104. All welds shall be 100% radiographed. After the installation is completed, the entire pipeline shall be hydrostatically tested with clean water.

2.5.2 Green Field Terminal

Jhapa Gree Field Terminal (GFT) is located at Charali, Mechinagar Municipality ward 13, Jhapa, Koshi Province. The location according to the Global Positioning System is 88°3'36.74" East and 26°38'14.86" North. The proposed GFT can access through the Mechi highway 1.7 KM south to the Charali Chock. It lies on the right of the Mechi highway (Bhadrapur to Ilam) and Hatemalo CommunityForest, Charali is located on the opposite of the project site.

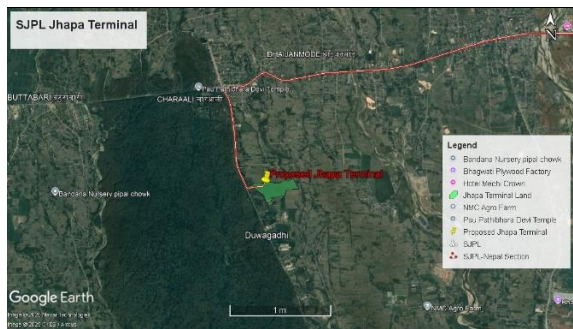


Figure 2-V: Location of GFT on Google Earth



Figure 2-VI: Nearer view of GFT on Google Earth

The total area of receiving terminal, as per the Lal Purja is 23 Bigha 3 kattha 13 Dhur and consists of 20 plots owned by NOC. As NOC holds ownership of the terminal site land, no additional land procurement is necessary for the development of the terminal infrastructure.

Terminal Facilities:

The Jhapa Terminal constitutes a facilities installation within the project framework, engineered to receive refined petroleum products via the Siliguri-Jhapa Pipeline (SJPL), exhibiting a total storage capacity of 18,900 kiloliters. The terminal's infrastructure encompasses a tank farm; specifically comprising 3 x 2, 200 KL MS tanks equipped with internal floating roofs and 3 x 4,100 KL HSD tanks featuring conical roofs. To facilitate efficient logistical operations, the terminal will incorporate a 1x8 bay Truck Loading Facility (TLF) shed, designed with bottom loading manifolds and provisions for future expansion, in conjunction with integrated pumping systems and a Level 1 (L-1) Automation system. The site will also accommodate an integrated control center and a Power and Motor Control Center (PMCC) room, fire protection systems, a security building, a Storage and Dispatch (S&D) facility, a Tank Truck (TT) decantation facility, a TT vehicle parking area, and a first-aid station. Essential utilities, such as Diesel Generator (DG) sets and an Oil Water Separator (OWS), will be installed, alongside a calibration laboratory, a sample room, and a quality control (QC) laboratory.

Table 2-I: List of facilities at Jhapa GFT

S.N.	DESCRIPTION	SIZE	REMARK
1.	SECURITY ROOM AT GATE	3M x 3M	
2.	SECURITY / CHANGE ROOM AT GATE	10M x 7M	
3.	ADMIN BUILDING (G+FF)	40M x 18M	
4.	CONTROL ROOM WITH MEZZANINE FLOOR	25M x 18M	
5.	SECURITY BARRACK	30M x 25M	
6.	TT DRIVER REST ROOM	15M x 8M	
7.	CALIBRATION FACILITY	22M x 8M	
8.	CALIBRATION WATER TANK	6M x 4M	
9.	CAR & SCOOTER PARKING SHED	35M x 12M	
10.	QC LAB	25M x 12M	
11.	AMENITY BLOCK (G+FF)	21M x 12M	
12.	HIGH TENSION (HT) YARD	7M x 7M	
13.	FUTURE VRU	15M x 10M	
14.	PMCC (MKT + PL) WITH MEZZANINE FLOOR	40M x 20M	
15.	FUTURE U/G TANK	10M x 4M	
16.	PPE ROOM	5M x 5M	
17.	DG SET AREA	30M x 5M	
18.	FIRE PUMP & FOAM PUMP HOUSE	40M x 8M	
19.	SUMP TANK	9M x 5M	
20.	INVOICE ROOM / TT LOCK/UNLOCK SHED	20M x 12M	
21.	STORE / M&R	30M x 12M	
22.	OILY WATER SEPARATOR (OWS)	30M x 12M	
23.	SAMPLE ROOM	35M x 15M	
24.	TT CHECKING PLATFORM	7M x 5M	

25.	TT SURPRISE CHECKING	11M x 2M	
26.	TLF PUMP HOUSE	11M x 2M	
27.	8 TLF BAY – 1 NOS.	65M x 6M	
28.	8 FUTURE TLF BAY	16M x 52M	
29.	EMERGENCY GATE / EXIT	6M x 6M	
30.	PIPELINE RECEIPT FACILITY	96M x 84M	

With a view to long-term development, the project incorporates provisions for the future expansion of the Jhapa Terminal and the integration of Ethanol and Bio-Diesel handling capabilities. Furthermore, tankage requirements will be subject to a reassessment after a triennial period, with IOC committed to providing supplemental tankage and associated pipeline and manifold infrastructure, if deemed necessary.

Table 1-II: Details of the tanks for storage

S. N.	TANK NO.	DIAMETER*HEIGHT (METERS)	SAFE FILL CAPACITY	PRODUCT	PRODUCT CLASS	ROOF TYPE
1.	TK-01	16.0M DIA.*13.5M HT	2200 KL	MS	A	CR-IFR
2.	TK-02	16.0M DIA.*13.5M HT	2200 KL	MS	A	CR-IFR
3.	TK-03	16.0M DIA.*13.5M HT	2200 KL	MS	A	CR-IFR
4.	TK-04	8.0M DIA*7.5M HT	250 KL	TRANSMIX	A	CR-IFR
5.	TK-05	8.0M DIA*7.5M HT	250 KL	TRANSMIX	A	CR-IFR
6.	TK-06	22.0M DIA** 13.5 HT	4100 KL	HSD	B	CRVT
7.	TK-07	22.0M DIA** 13.5 HT	4100 KL	HSD	B	CRVT
8.	TK-08	22.0M DIA** 13.5 HT	4100 KL	HSD	B	CRVT
9.	TK-09	6.0M DIA*6.0M HT	100 KL	SLUDGE	EXCLUDED	CRVT
10.	TK-10	3.0M DIA*7.5M LG	50 KL	MS	A	UG
11.	TK-11	3.0M DIA*7.5M LG	50 KL	HSD	B	UG
12.	TK-12	2.11M DIA*6.0M LG	20 KL	HSD	B	UG
13.	TK-13	16.0M DIS*18.5M HT	3200 KL	WATER	-	CRVT
14.	TK-14	26.0M DIA*18.5M HT	3200 KL	WATER	-	CRVT

Since, no process or manufacturing involved, there is no hazardous waste is generated as byproducts during operation. The waste generated from DG set and fire engines will be collected in barrel and stored in a closed shed until its disposal and the same will be disposed to gem lubricants.

2.5.3 Salient Features of the Project

Table 2-III: Salient Features of Project

Petroleum Pipeline		
S.N.	Parameter	Technical Details
1.	Project Name	Siliguri-Jhapa Petroleum Pipeline (SJPL) - Nepal Section
2.	Total Length (Nepal)	Approximate 14.6 km (Start: Kakarvitta Mechi Bridge; End: Duhagadhi, Jhapa)

3.	Pipeline Diameter	8 inches (Carbon Steel)	
4.	Burial Depth	Minimum 1.2 meters (standard); deeper at crossings	
5.	Land use	Within the Highways's RoW	
6.	Design Pressure	Typically 90–100 kg/cm ² (Design for 1 MMTPA capacity)	
7.	Corrosion Protection	3-Layer Polyethylene (3LPE) coating + Cathodic Protection	
8.	Seismic Resilience	Design Coefficient: 0.34 (as per NBC 105:2020)	
9.	Safety Monitoring	SCADA system with Leak Detection System (LDS)	
10.	Start Coordinates	E: 88°9'51.03", N: 26°38'42.09" (Mechi Bridge)	
Jhapa Green Field Terminal (GFT)			
S.N.	Component	Facility Details	
1.	Terminal Name	Jhapa Greenfield Terminal	
2.	Location	Duhagadhi, Mechinagar Municipality-13, Jhapa	
3.	Total Storage Capacity	18,900 KLD	
4.	Product Split	Diesel: 12,300 kL (est.); Petrol: 6,600 kL (est.)	
5.	End Coordinates	E: 88°3'36.74", N: 26°38'14.86"	
6.	Terminal	Area	23 Bigha 3 kattha 13 Dhur as per the Lal Purja
7.	Land	Ownership	Nepal Oil Corporation
8.	Boundary wall		3 Meter heigh from inland
9.	Loading Gantry		High-speed automated TLF (Tank Lorry Filling) bays
10.	Firefighting System		Medium Expansion Foam system + Fire Water Tanks & Monitors
11.	Env. Protection		Closed Roof Vapor Tight (CRVT), Cone Roof-Internal Floating Roof (CR-IFR), Oil-Water Separator (OWS) + Vapor Recovery System (VRS)
12.	Power Supply		Dual Source (NEA Grid + Dedicated Backup DG Sets)
13.	Automation		Fully integrated TAS (Terminal Automation System)

2.5.4 Safety and Security System

2.5.4.1 Petroleum Pipeline

A. Supervisory Control and Data Acquisition (SCADA) System

SCADA system is used in monitoring and control of Pipelines from single location. The system has a centralized system that monitors and controls entire pump stations, delivery stations and SVs across the country. It is common in complex cross-country Oil & Gas infrastructure projects to have a SCADA system. The SCADA system is envisaged to ensure effective and reliable control management and supervision of the pipeline from centralized location using RTUs at various pipeline facilities.

To ensure effective and reliable control, management and supervision of the pipeline; the pipeline would have dedicated SCADA & Application Package Software (APPS) system with centralized Master control station (MCS) at Siliguri. The APPS system shall run at Master

Control Station (MCS). Considering the length of pipeline, backup Master Control Station (BWCS) is not considered.

B. Application Package Software (APPS)

The prime objective of application software shall be to aid the dispatcher in making control decisions and to enable him to take optimal control actions while ensuring the safety and security of the pipeline network. The following models would constitute the application software:

- Real Time Transient Model/ Negative Pressure wave technique based leak detection system suitable for dynamic and shut in condition
- Shut-in Leak Detection & Leak Location
- Pig Tracking
- Batch Tracking/ Line fill computation

C. Telecommunication System

For the telecommunication system of the Siliguri-Jhapa Pipeline, it is envisaged to deploy an STM-16 based network in a ring configuration at all locations, namely Siliguri, Jhapa, and 4 SV (Sectional Valve) locations. This STM-based network ring will be interfaced with the existing telecom system of GSPL. A Synchronous Digital Hierarchy (SDH) node is envisaged for Siliguri, the metering station, and Jhapa, including all intermediate RCP (Remote Control Point) locations.

A new 24-fiber composite OFC (Optical Fiber Cable) network, comprising 16 G.652D/G.657A1 fibers and 8 G.655 fibers, has been considered for the entire pipeline length. The G.655 and G.652D/G.657A1 fibers will be used for long-haul and short-haul data highways, respectively. The new fiber installation includes sufficient fibers for the future deployment of an optical fiber-based third-party intrusion detection system; otherwise, it would be difficult to lay an OFC cable independently at a later stage.

The RTU (Remote Terminal Unit) data and CCTV requirements of RCP/MOV (Motor Operated Valve) locations along the pipeline will be supported by the network connectivity using fibers from the OFC network.

A CCTV-based surveillance system has been considered for the upcoming MLPU (Metering and Launching Pig Unit) shed, piping area, security gate, and perimeter surveillance at Siliguri Station. CCTVs are also considered for the piping area, security gate, and perimeter at Jhapa station. At SV/RCP locations, one IP PTZ camera and one fixed camera are envisaged for surveillance of the MOV/RCP premises. A Control Centre for the CCTV System is planned for monitoring and recording footage from unmanned locations along the entire pipeline section, managed from corresponding attended stations. This video feed will be available over a LAN connection at all stations via Ethernet.

D. Cathodic Protection

- a. Mitigation of external corrosion of the mainline will be achieved through an impressed current-based cathodic protection system.
- b. For protection of station piping against external corrosion, an impressed current-based cathodic protection system has been considered at Siliguri and Jhapa stations.
- c. Temporary cathodic protection by magnesium anodes will be provided by installing Test Lead Points (TLPs) every 1 km along the mainline until permanent cathodic protection is put into service. In addition, 2 Mg anodes will be installed on both sides of major cased crossings.
- d. Electrical Resistance probes have been considered at Siliguri & Jhapa stations as per OISD guidelines.

E. Pigging System

It is the system established for sending materials in different types that are called PIG into the pipe for the purpose of cleaning the debris that would compose in the pipe. Pigging system constitutes of two separate divisions.

- i. Launcher: This is situated on the pipeline at which the petroleum products supply is provided. The material which is called as PIG is placed in the pipeline at this point.
- ii. Blocker: It is situated on the pipeline and at the end of the line. The PIG within the pipeline is discharged from this point. In this project, the PIG will be discharged at Jhapa terminal. Movement of the PIG which is delivered to the line from the launcher is provided by the pressure of the petroleum products within the line. When it reaches to the end of the line i.e. to blocker, then the line has been cleaned.

2.5.4.2 Jhapa Green Field Terminal**A. Fire & Gas Detection System**

Fire and gas detection systems are designed to mitigate unexpected events in the process installations. Fire and Gas detection systems are key to maintain the overall safety and operation of industrial facilities. F&G safety system continuously monitors for abnormal situations such as a fire, or combustible or toxic gas release within the plant; and provides early warning and mitigation actions to prevent escalation of the incident and protect the process or environment. By implementing an integrated fire and gas detection system based on the latest automation technology, industries can meet their plant safety and critical infrastructure protection requirements.

B. Facilities at originating station and delivery station

A reliable and efficient SIL-3 PLC based integrated fire detection, alarm and protection system comprising of SIL-3 PLC system, fire alarm panel and fire & gas detectors are considered at Siliguri pump station and Jhapa delivery station. The following type of

detectors/ sensors would be provided for the fire & gas detection system in the installations at all attended stations:

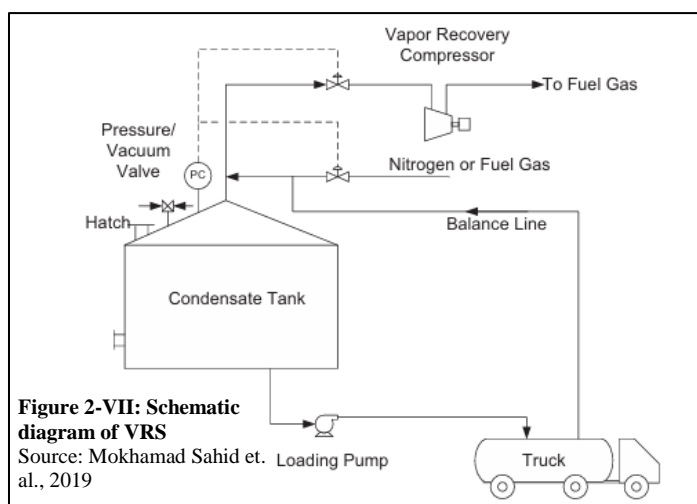
- For hydrocarbon detection in piping area, explosion proof & weather proof IR hydrocarbon detectors have been considered for potential leak sources
- For fire detection in control buildings and other buildings like admin building, workshops etc. multi-sensor detectors are considered
- Manual call points, hooters and beacons for hazardous area in field and non-hazardous area inside building have also been envisaged
- Hydrocarbon detectors and firefighting pumps would be interfaced with SIL-3 PLC
- Multi-sensor detectors, rate of rise (ROR) heat detectors, manual call points, beacons, hooters etc. would be interfaced with fire alarm panel.

Facilities like optical fiber cable and closed-circuit television (CCTV) system for effective surveillance and communication will be provided for essential and reliable operation of the pipeline. The receiving terminals will have fire alarm and detection system, fire hydrant network and related facilities. The earthing system will be built up, adhering to international standards, for the storage tanks to ensure safety by preventing the accumulation of static electricity, mitigating lightning risks, and protecting against electrical faults.

C. Vapor Recovery System

SA Vapour Recovery System (VRS) is a specialized pollution control infrastructure designed to capture Volatile Organic Compounds (VOCs) that would otherwise escape during petroleum operations. In a terminal environment, these vapors are generated primarily during the filling and emptying of storage tanks, the loading and unloading of tankers, and through natural evaporation caused by temperature fluctuations. By capturing these emissions, a VRS serves as a critical safeguard against economic loss, as it recovers valuable fuel that would literally vanish into thin air, while simultaneously reducing the risk of fire and toxic exposure for terminal workers.

Implementing a VRS provides significant multi-dimensional benefits. Beyond the direct recovery of product, it improves local air quality and ensures the terminal remains in compliance with strict environmental standards, such as those set by the OISD.



2.6 Code and Standards related to the Project

All the project related code and standards are as of Oil Industry and Safety Directorate, under the minister of Petroleum and Natural Gas, Government of India. Some major standards are listed below;

Table 2-IV: Project related Standards

Category	OISD Standard	Focus Area
Pipeline Engineering	OISD-STD-141	Design, laying, and testing of the cross-border pipe.
Safety Distances	OISD-STD-118	Minimum gaps between tanks, pumps, and roads.
Firefighting	OISD-STD-117	Firewater tanks, hydrants, and foam systems.
Integrity	OISD-STD-138 / 188	Inspection and Cathodic Protection.
Operations	OISD-STD-244	Loading/unloading and terminal automation.

2.7 Petroleum pipe laying Methodology

The sequence and methodology of construction of petroleum pipeline is given below:

- Stringing–Pipes are transported to the site on trucks will be offloaded using side booms. Pipes are then strung adjacent to the trench. Trailers and cranes will be used for maneuvering of pipes. This activity may be done before or after trenching.
- Trenching - Trenchers and backhoe type excavators will be used to dig the trench for laying the pipeline. The excavated sub-soil will be stockpiled separately for backfill. But the backfilling of the trenches cut and opened should be done on the same day especially at the areas with dense population to avoid any possible accidents for the trespassers.
- Bending – Pipes will be bent using a bending machine to the appropriate angle to match the vertical and horizontal alignment of the trench.
- Welding - Welding will be done using conventional manual/ semi-automatic welding involving a crew of welders and fitters. Once the pipe is strung a line-up crew will position the pipe using side booms in preparation for welding. Pipe strings to be welded will be effectively earthed.
- Non-Destructive Testing (NDT) - Mechanized Ultrasonic Testing (MUT) is the specified method to be applied for the execution of NDT. Each field weld will be 100% radiographed to test for soundness of the weld in compliance with specifications. NDT and its evaluation shall be performed in accordance with API Standard 1104.
- Coating: After welding at each weld joint, coating of field joints of bare pipes and the repair of coating shall be done by.
- Burial - General burial depth of the pipeline along the route will be with a minimum 1.2 meter cover. Burial cover will be compacted to avoid future erosion by all weathers.

- Backfilling - The excavated sub-soil will be returned to the trench. Backfilling will be managed so that damage from sizable rocks is not used or any other materials that may damage the pipeline.
- Crossings – Horizontal Directional Drilling (HDD) technology will be used in all river/stream crossings.
- Restoration - Restoration of the trench will be conducted progressively following the completion of construction work. This will involve removal of foreign materials such as construction debris and wastes. The trench will be returned to its original condition from where it was stripped. Special focus will be given to restoration of side slopes and beds of natural water body crossings.
- Pipeline warning markers–In the final stages of construction, warning marker posts will be erected indicating the location of the pipeline and the crossing of other pipelines, cables and features. A marker tape will be placed in the trench 500 mm above the pipeline to indicate to future excavators that a pipeline is below and that they are nearing.

2.8 Project Activities

2.8.1 Pre-Construction

This pipeline project is being carried out in close coordination with the Department of Roads. Currently the two lane East-West highway from Kakatbhitta, Jhapa to Laukahi, Sunsari is under the expansion phase to Asian Highway grade. The project will use the highway's right of way from Kakarvbhitta to Charali.

a. Land acquisition and public utilities relocation

Pipeline passes through Right of Way of East-West Highway which are government owned land and project do not need private land. Transmission lines, telephone lines, water supply system that fall within the road alignment is relocated under the road expansion project already. No rehabilitation or resettlement plan is required to be taken into account as no dwelling units would need to be displaced in the land being acquired for the project.

b. Infrastructure development

The construction material storage, site office area, labor camps with all the essential facilities will be developed at FGT. The construction crew camping facilities, required heavy equipment like soil excavators for digging the trenches, and storage of construction material etc. will be established at appropriate places along the entire pipeline alignment route to carry out the project smoothly.

2.8.2 During Construction

a. Horizontal Directional Drilling (HDD) works

The advantage of HDD technology is economic and quick and mitigates possible environmental consequences. After completion of drilling it is possible to restore the original

state without major interventions. HDD can be carried out wherever work with classic excavation is not possible, cost effective or otherwise feasible.

The main advantages of horizontal drilling are that bores can be made where necessary at greater depths, under built structures and under various natural barriers. (e.g, underneath rivers, where waterproofing is ensured. No traffic for bores under roadways so that traffic can flow without interruption throughout construction or beneath environmentally sensitive areas where any intervention would leave unacceptable damage.)

b. Welding, Radiographic & NDT inspection works

Radiographic Testing (RT) is a nondestructive examination (NDE) technique that involves the use of either x-rays or gamma rays to view the internal structure of a component. In the petrochemical industry, RT is often used to inspect machinery, such as pressure vessels and valves, to detect for flaws. RT is also used to inspect weld repairs.

c. Calliper survey works

The Pipeline Engineering Service team should be able to carry out a range of pipeline profiling requirements. This is done using a Caliper Tool which locates features and anomalies in pipelines such as: Dents, Ovalities, Girth welds, Valves. Typically a caliper survey will be carried out

- i. After construction of a pipeline
- ii. After modifications to a pipeline and
- iii. Prior to an Intelligent Pig Survey.

2.8.3 During Post-construction and Operation

- Pipeline Monitoring and Inspection:
- Testing and Commissioning: Final verification and testing to ensure full pipeline operability.
- Maintenance and Repairs: Routine maintenance for efficient pipeline functionality, including repair or replacement of damaged components.
- Environmental Monitoring: Continuous surveillance for environmental impact.

The proposed pipeline from Siliguri to Jhapa would transport MS-Motor Spirit/Petrol, HSD-High Speed Diesel, PCK/SKO-Permium Kerosene/Super Kerosene Oil, ATF- Aviation Turbine Fuel sourced either GSPL or Siliguri Tanks. The typical pumping sequence would be as HSD-PCK/SKO-MS-SKO/PCK/ZSKO-ATF-ZSKO/PCK/SKO-HSD. The control rooms for the whole project would be provided at originating station (Siliguri) and receiving station (Jhapa). The mass flow meters which have accuracy of $\pm 0.1\%$ of mass flow rate and density accuracy of ± 0.0005 gm/cc would be provided at Siliguri pump station, Jhapa delivery station and check metering station. The 230 V AC, single phase redundant UPS with minimum 4

hours battery backup would be provided in both stations, Siliguri and Jhapa. A SCADA system will be used in monitoring and control of Pipeline.

2.9 Requirements for the Project

2.9.1 Land Area

2.9.1.1 Pipeline

The Pipeline passes within RoW of H-01 East-West Highway (to Kankai) and H-07 Mechi Highway (Bhadrapur-Ilam) for 11.736 KM and 1.706 KM length respectively. The total RoW of the E-W Highway is 50 m. whereas that of Mechi highway is 30 m. The pipeline will undergrounded in 2-3 meter from the encroached free RoW edge of the East-West Highway and same for the Mechi highway. The planned excavation will entail a lateral extent of 2 meters and a vertical depth of not less than 1.2 meters.

2.9.1.2 GFT

The Green Field Terminal will be built up barren land at Duhagadi, Mechinagar Municipality-13, about 1.7 km south to the Charali Chowk, Jhapa. The total area of receiving terminal as per the Lal Purja is 157005.23 squares meters (23 Bigha 3 kattha 13 Dhur) and consists of 20 plots owned by the Nepal Oil Corporation.

2.9.2 Type of Land

As the most of pipeline passes through the RoW of the highway, the land is government land owned by Department of Road, Ministry of Physical Infrastructure and Transport.

The area for the Green Field Terminal is 157005.23 squares meters (23 Bigha 3 kattha 13 Dhur) as per Lal Purja (Official Documents), which is currently as barren land and owned by the NOC. The related documents are in Annex II.

2.9.3 Construction Materials and quality

For the construction of the SJPL Project, the primary materials for the pipeline will be steel pipe that conforms to PSL2 of API 5L quality. The wall of thickness of the steel pipe will be determined based on factors specified in PNGRB T4S, ASME B31.4, and OISD-STD-141, particularly for various types of crossings. Additionally, civil work will require materials such as cement and aggregate, which will adhere to Nepal and Indian Standards. Approximately, 320,000 cubic meter filling material is needed for the terminal land development. The land filling materials will be sourced from legally authorized and environmentally approved local sites, as identified by the concerned district offices, and/ local authorities.

2.9.4 Energy and Carbon Footprint

The energy and fuel requirements for the project will primarily diesel and petrol, and quantity will be determined based on the specific requirements of the project activities.

Table 2-V: Fuel Rrequired and carbon emission during construction

S.N.	Type of Fuel	Estimated Quantity (Liter)	Emission factor	Expected Emission (CO ₂ e)	Remarks
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1.	Diesel	450,000	2.68	1206000	Primary fuel for heavy machinery, HDD rigs, and DG sets.
2.	Petrol	25,000	2.30	57750	Used for light inspection vehicles and portable pumps.
3.	Kerosene	5,000	2.51	12600	Used for localized cleaning and specific site utilities.
Total	—		—	1276350 kg	Total Construction Carbon Footprint

2.9.5 Human Resource

The Human resources requirements for the Project are estimated to include approximately 20 skilled, 30 semiskilled, and 50 unskilled workers.

Table 2-VI: Human resources involve in Project

S.N.	Human resources	Number	Duration
During Construction			
1.	Skilled	20 Approx.	3 yrs.
2.	Semi-skilled	30 Approx.	3 yrs.
3.	Unskilled	50 Approx.	3 yrs.
During Operation*			
1.	NOC Staffs, authorities and helper	30 Approx	

* Number can be changed as per NOC policy

2.9.6 Water Supply for the Project

The deep boring facility is designated as the water source for both the construction and operational phases of the project. During the construction phase, the estimated daily water demand for 100 personnel, based on a consumption rate of 200 liters per person per day, totals 20,000 liters. For the operational phase of the terminal, the daily water demand is projected to be 15,000 liters, accounting for 100 individuals, inclusive of both staff and visitors.

Table 2-VII: Water supply for the project

Construction Phase		Operation Phase	
Water Source	Capacity	Water Source	Capacity
Deep Boring	25,000 Liters/Day	Deep Boring	2-3 Lakh Liters/Day
Storage & Consumption		Storage & Consumption	

Raw Water Storage Tank	20 Thousand Liters	Raw Water Storage Tank (Underground)	25,000 Liters
		Purified Water Storage Tank (Underground)	25,000 Liters
		Overhead Tank	20,000 Liters
Consumption	20 Thousand Liters/Day	Consumption	15,000 Liters/Day
		Fire Fighting Storage (Underground)	250000 Liters
		Cleaning and Maintenance	20,000 Liters/day

The workforce camp will be provisioned with access to potable water and other essential amenities. All waste streams generated within the camp facilities will undergo source segregation and subsequent appropriate management. A dedicated septic tank will be constructed to handle sanitation requirements. Upon cessation of project activities, the camp and all associated ancillary facilities will be systematically demolished in strict adherence to prevailing environmental legislation.

2.9.7 Construction Camp and Material Storage Site

The workforce camp and stockpiling site will be installed within the proposed green field terminal. The additional land along the pipeline for the storage purposes is not supposed. If it requires, the project could select or identify suitable location in coordination with engineer and local including the option of hiring the nearby private land.

2.9.8 Muck Management

The majority of the spoil material generated by excavation of trenches using a pipeline will be reused for backfilling after quality inspection. Where disposal of excess material cannot be avoided, disposal areas will be identified in accordance with environmental regulations and best management practices. Disposal operations will always be conducted under close monitoring so that proper containment and environmental protection measures are taken.

2.9.9 Technologies and Machinery Equipment

Table 2-VIII: Machinery Equipment/Technologies required for project

S.N.	Category	Equipment/Technology
1.	Trench Preparation	- Bulldozers - Excavators - Chainsaws
2.	Pipeline Installation	- Welding Machines - Pipe Laying Machines - Trenching Machines - Horizontal Directional Drilling (HDD) Rigs - Pipe Facing Machines - Coating and Wrapping Machines - Backfilling Equipment; Bulldozers, Compactors
3.	Pumping & Control	- Pumps

		<ul style="list-style-type: none"> - Valves - SCADA Systems - PLC (Programmable Logic Controllers) - Metering Systems - Pressure Gauges and Sensors
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2.9.10 Estimated Waste Generation

The estimated waste during the construction and operation of the project is tabulated below;

Table 2-VIII: Estimated Waste and their management

Phase	Waste Type	Estimated Quantity	Source/Reference	Management & Reduction Strategy
Construction	Concrete & Masonry	450–600 Tons	3–5% wastage of foundation/bund civil works.	Reuse for internal road sub-base and site leveling.
	Structural Metal	80–120 Tons	2–3% off-cut rate for API 5L pipes & tank plates.	"Buy-back" agreements with vendors; segregation for local scrap resale.
	Household Waste	30 kg / day	0.3 kg/day/worker for 100 workers (World Bank).	On-site organic composting; timely pickup for non-recyclables.
Operation	Household waste/Waste from Staffs	8 kg/day	Approximately 30 staffs and 0.27 kg/staffs/day	Source segregation and in coordination with Municipality.
	Chemical waste	The quantity of residual chemical waste generated during storage of oil depends up on the frequency of the cleaning Oil tank. Such oil residual will be managed by NOC itself.		

CHAPTER 3: METHODOLOGY ADOPTED FOR PREPARING THE EIA REPORT

For the preparation of EIA report, different methods and methodologies were adopted. The methodology was mainly guided by the EPA, 2019, EPR, 2020 and National EIA Guidelines, 2050. Terms and conditions received from the then MoFE during approval of ToR were followed during EIA. Literature review, Public consultation and meetings, Walkthrough survey, Geographic Information System (GIS) analysis were some important tools used for data collection. Detailed descriptions of these various approaches are elaborated in the following sub-sections.

3.1 Literature Review

Information from different sources was collected and reviewed to understand the nature of the project and to identify the significant issues. Literatures collected and reviewed during the EIA are as listed in bibliography of the report. Mainly the detail design report of Pipeline alignment and GFT were reviewed before site mobilization.

3.1.1 Physical Environment

The topographic maps published by Department of Survey/GoN were reviewed before site mobilization. The project layout was drawn in the map and carried/referred during the whole site study. These maps were used to figure out pipeline alignment, HHs/lands/settlement simultaneously using Hand GPS Receivers. Topographical and land use maps of the area were studied using Topographic Maps and Google Earth image and were verified during field visit.

Data on temperature and precipitation are taken from Department of Hydrology and Meteorology (DHM). Information on geology was derived from the geological investigation report of Project. The details of different topographical maps used produced by the His Majesty, Government of Nepal, Department of Survey during the study period are given in following table.

Table 3-I: Details of Topographic Maps of Project Area

S.N.	Name of Topographic Sheet	Sheet No.	Scale	Year of Publication
1.	Kakarbhitta	2688 05B	1:25000	1996
2.	Dhulabari	2688 05A	1:25000	1996

3.1.2 Biological Environment

Publications of Division Forest Office (DFO) of Jhapa district were reviewed to collect general information on forest area, types and management. Information on biodiversity of project impact area was collected from the field visit and FGD. Different literature on birds and mammals, as listed in Bibliography, were reviewed.

3.1.3 Socio-Economic and Cultural Environment

The major reports and publications consulted include National Population and Housing Census (2021) published by National Statistics Office (NSO). Socio-economic and cultural data, such as population of project affected Municipality, households' size, male-female ratio, infrastructures, ethnicity, religion, etc. were derived from NSO publications.

3.2 Preparation of Scoping Document (SD) and Terms of Reference (ToR)

The scoping and ToR for the EIA was prepared, submit, and approved by the Minister of Forest and Environment, Government of Nepal. The comprehensive EIA study was carried out according to the approved ToR and current practice.

3.3 Determination of the Project's Impact Area

Based on the magnitude of the predicted impacts, the project impact area is divided into following two categories;

3.3.1 Direct Impact Area (DIA)

The area where direct alteration in the exiting environmental conditions occurs as a consequences of project activity. So, the DIA includes all the components of the project which mainly consists of RoW of petroleum pipeline. The supplementary features such as camp area, muck disposal site, are also considered as DIA. There is no such guideline for the determining of the impact area of the project during construction and operation.

Table 3-II: Factors considered for DIA calculation

Component	Factors	Width considered/Area	Remark
Petroleum pipeline	Pipeline RoW, as per approved by Ministry of Physical Infrastructure, GoN	1 M.	Permanent,
	Excavation work in case of open cut trench	Max. 2 M.	Temporary
	Construction RoW	8 meter	Temporary
	Construction Safety Zone	12 meter	Temporary
	Surface water bodies	100 meter on both side	Temporary
	Forest area	100 meter west from pipeline	Temporary
Green Field Terminal	Proposed land extended upto the boundary	23 Bigha 3 Kaththa 13 Dhur (as per Lalpurja)	Permanent

3.3.2 Indirect Impact Area (IIA)

This consists of the area where no physical restriction or permanent land use change occurs but where requires emergency planning, risk assessment or public awareness program about the project. Any built-up community infrastructures and facilities, forests, surrounding the DIA shall be studied in this impact area. The buffer distance is taken based on the pressure and diameter of the pipeline.

Table 3-III: Factors considered for IIA calculation

Component	Factors	Buffer Distance from Pipeline	References
Petroleum Pipeline	Thermal Hazard-PIR	65 M	US DOT PHMSA
	Pool Fire Hazard	100 M	OISD-STD-118 / IP-15
	Flameable Vapour Cloud	125 M	API RP 752 / 753
	Terrestrial and Aquatic Impacts	500 M*	*best practice
Green Field Terminal	Physical and Biological aspects	200 M buffer from the terminal boundary	OISD-STD-244 / OISD-GDN-115

3.3.3 Zone of Influence

Eastern part of Nepal, i.e Koshi Province and some parts of Madhesh Province are considered as the zone of influence (ZoI)

3.4 Field Observation and Data Collection

The EIA study team conducted extensive field visits along the proposed petroleum pipeline alignment from October to November 2025. The primary objective was to collect, update, and verify baseline information regarding the physical, biological, socio-economic, and cultural environments within the project's influence area.

To ensure systematic data gathering, specialized checklists and questionnaires were developed and administered. These tools were specifically tailored to capture the environmental and social nuances of a pipeline project. Furthermore, the following techniques and methodologies were implemented during the field data collection process:

3.4.1 Physical Environment

i. Physiography and Land Use

The study utilized Geographic Information System (GIS) tools to map the topography of the pipeline alignment. Topographical maps were used to produce land-use maps that identify the interface between the pipeline alignment and adjacent land. These maps were verified through field surveys and Google Earth images to ensure the pipeline alignment.

ii. Hydrology

All the rivers and rivulets crossed by the petroleum pipeline alignment were recorded. Special attention was paid to existing highway bridges and culverts. Catchments were delineated via GIS to assess flood levels. Further perennial and seasonal rivers have been categorized. Catchments of the river area have been delineated by GIS and checked by overlapping them on Google map.

iii. Climate

Climatic parameters, specifically temperature and rainfall, were analyzed using data from the nearest DHM stations. For a highway-based pipeline, temperature analysis is critical for managing the thermal expansion of the pipe under paved surfaces, while rainfall was used to

assess the risk of highway embankment erosion and drainage overflow that could affect the stability of the pipeline trench.

Table 3-IV: Meteorological Data Stations

S. N.	Station Name	DHM Index no.	Measuring Type	Longitude (E)	Latitude (N)	Elevation (m)	Approx. distance (KM)
a.	Chandra Gadhi	1412	Rainfall	88.080655	26.575753	90	6.91
b.	Anarmani Birta	1409	Precipitation	87.987228	26.625063	112	7
c.	Sanischare	1415	Precipitation	87.988611	26.6897222	168	7.68
d.	Kechana	1422	Climatology	88.003749	26.3961666	71	26.5
e.	Bahundangi	141502	Precipitation	88.16	26.79		15

iv. Geological Characteristics

Geological assessment focused on the stability of the highway embankment and the composition of the alluvial soil in the Terai. The team evaluated the risk of soil liquefaction and lateral spreading near road-crossings. Local stakeholders were interviewed regarding historical flooding to ensure that the pipeline installation does not compromise the structural integrity of the existing highway pavement.

v. Air and Noise Quality

Air quality and noise level was conducted at 3 locations, two along the petroleum pipeline alignment, specifically targeting high-traffic highway intersections sensitive receptors such as dense settlement, located along the highway and one on the proposed green field terminal. In addition to standard pollutants, Benzene and Lead were measured to establish a baseline in an environment already influenced by vehicular emissions. Further, the data have been analyzed with references of National Ambient Air Quality Standards (NAAQS), 2062 and WHO Air Quality Guidelines, 2005.

Instrument Specifications for Air Quality Sampling

Equipment: Multi-Parameter Portable Air Quality Monitor

Product: Pollusense

Model No: B001S001

Accuracy: $< \pm 5\%$ FS (at $20 \pm 5^\circ\text{C}/50 \pm 20\%$ R.H)

Sampling Mode: Active-Continuous

Table 3-V: Air Quality Sampling Location

Lab Code	Location	Latitude / Longitude	Sampling Period (2025)	Site Code
25/12-2212 (1)	Mechinagar-13, Charali, Jhapa	$26^\circ 38' 9.83''\text{N}$ / $88^\circ 51' 8.77''\text{E}$	Nov 15 (10:40 AM) – Nov 16 (10:40 AM)	AQ1

Lab Code	Location	Latitude / Longitude	Sampling Period (2025)	Site Code
25/12-2212 (2)	Mechinagar-10, Dhulabari Chowk	26°29'37.85"N / 88°6'13.37"E	Nov 16 (1:20 PM) – Nov 17 (1:20 PM)	AQ2
25/12-2212 (3)	Kakarbhitta	26°38'50.62"N / 88°9'9.18"E	Nov 17 (5:10 PM) – Nov 18 (5:10 PM)	AQ3

Noise levels were recorded during day and night at the same locations to distinguish between existing highway traffic noise and the potential cumulative impact of pipeline construction. Further, the recorded data were analyzed based on National Ambient Sound Quality Standard, 2012 and WHO Standards, 1999.

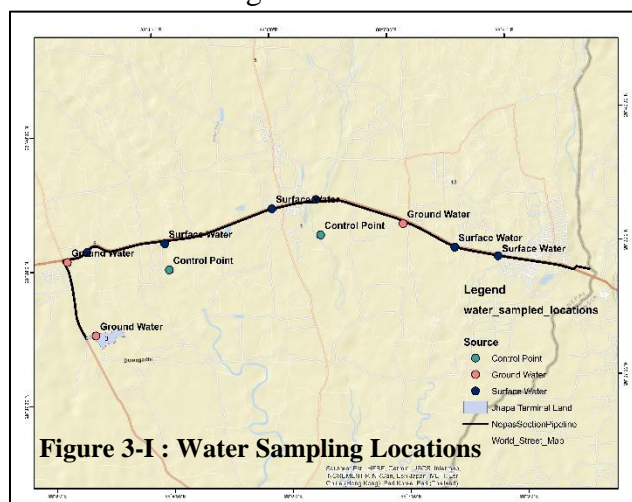
Table 3-VI: Details of Noise Level monitoring locations

S.N.	Location	Latitude	Longitude	Station Code	Sampling Period (2025)	Remark
1.	Jhapa Green Field Terminal	26.63665°	88.06152°	NQ1	Nov 15 (10:40 AM) – Nov 16 (10:40 AM)	
2.	Near Dhulabari Chowk	26.66008°	88.10280°	NQ2	Nov 16 (1:20 PM) – Nov 17 (1:20 PM)	Residential Area
3.	Kakarvitta, near Kali Khola	26.64749°	88.15057°	NQ3	Nov 17 (5:10 PM) – Nov 18 (5:10 PM)	

vi. Water Quality

Water quality was analyzed from 6 surface water bodies and 3 groundwater tube wells located along the highway and additionally two samples from surface water were collected from the approximately 500 M. downstream to the proposed pipeline. The assessment focused on identifying existing baseline water conditions. Samples were tested to ensure that pipeline construction does not further degrade the water sources caused by the project implementation.

The water sampling locations are depicted in Figure 3-I.



vii. Soil Characteristics

To understand the soil characteristics of project area, five composite samples were taken from the depth up to one meter depth.

Table 3-VII: Soil sampling details

S.N.	North	East	Date	Sampling Depth	Code
1.	26.6502132	88.137404	17 November, 2025	40 cm	S1
2.	26.6601464	88.110202	17 November, 2025	70cm	S2
3.	26.654123	88.0752264	17 November, 2025	1 metre	S3

S.N.	North	East	Date	Sampling Depth	Code
4.	26.6593515	88.1158638	18 November, 2025	70 cm	S4
5.	26.6376503	88.0594566	18 November, 2025	1 metre	S5

viii. Traffic Volume and Composition

The traffic volume and composition on the road was recorded during field visit. The vehicular movement was counted in different two locations.

ix. Public Properties and Utilities

During field survey, detail public properties/utilities was investigated with chainage in standard format. The survey was conducted with respective authorities, representatives and local user groups.

x. Identification of Ancillary facilities

Site for labor camp, pipe yards, and spoil disposal were studied at strategic locations with direct highway connectivity. The team collaborated with project engineers to ensure that Green Field Terminal as labor camp and stock piling site as it located at a safe distance from active traffic zones, enough space for stock piling, the work during construction will concentrate on the terminal and are situated on flat, non-inundated land to prevent sediment runoff from sites during the monsoon.

3.4.2 Biological Environment

i. Forest and Vegetation

A field survey was conducted in the forest areas along the road section. The tree, grass, and shrub species found along the pipeline alignment were recorded, and the types of forest and vegetation in the project area were analyzed. In addition, discussions were held with key local informants (representatives from the Division Forest Office, Jhapa; representatives of the local government units affected by the project; representatives of community forest user groups; and local people), and reference materials were reviewed. Since, no vegetation clearance is needed, the tree census was not conducted and hence the census derived indices such as species diversity index, species richness index, were not calculated.

ii. Wildlife and fauna

A field survey of the forest areas along the road section was carried out to gather information about the wildlife species in the project area (mammals, birds, aquatic animals, amphibians, reptiles), including their habitat, roaming areas, and movement zones. In addition, discussions were held with key informants (representatives from the Division Forest Office, Jhapa; representatives from the local government units affected by the project; teachers; local intellectuals; local government employees, etc.) and reference materials were reviewed to confirm information on wildlife found in the forests, especially mammals, birds, and reptile species that move around the area. Information were also collected from the Division Forest Office, Jhapa.

iii. Information on Tree and Wildlife Species Protection Status

Details of flora and fauna were collected regarding the protection category by the Government of Nepal, IUCN status and CITES protection status for the tree and wildlife species present in the project area.

3.4.3 Socio-economic and Cultural Environment

Initial walkover surveys were carried out, followed by individual interviews with municipality and ward chairperson and representatives, local government officials. The tools such as Focus Group Discussions (FGD) and Key Informant Interviews (KII) and household survey were carried out. Community-level consultation meetings at different wards were also held to sensitize the local community regarding different issues that can come up during implementation. During these meetings, locals raised different concerns and put forth their issues.

The primary data were collected from a household survey. The questionnaire investigated the main parameters: Household profile population, health status, family revenue and expenditure sanitation, educational institutions, major residential areas, educational institutions, agricultural productions and major farming practices etc. were collected.

The questionnaire for household survey was prepared in Nepali language to make respondents easily understand the issues. Besides, Focus Group Discussion, Public Consultation and Key Informant, Interviews through checklists were also administered. During field visit, different cultural resources which lie around were also collected.

3.5 Consultation Meeting

A total of 6 consultation meetings were conducted with primary stakeholders to gather opinions and local insights. The consultation involved a diverse range of participants, including municipal leaders, forest authorities, and Community Forest User Group. Additionally, 3 informal focus group discussions were held across various wards to engage directly with local residents. Through these consultations, project's objectives and activities were disclosed and their ideas, suggestions, and concerns were noted to make the project community friendly. Minutes of consultation meetings are given in Annex III.

3.5 Analysis of Acquired Data

Land use and structural inventories were established by integrating mapping data and survey reports with rigorous on-site field verifications. Primary data were processed using ArcGIS 10.8 and Google Earth to generate thematic maps and forecast environmental impacts. Comprehensive physical, biological, and socio-economic baselines were then finalized through quantitative analysis in MS Excel and qualitative descriptive methods. This systematic approach ensured data integrity, allowing for the development of precise mitigation strategies tailored to the project's objectives.

The identification of environmental consequences was further refined through a review of relevant laws, regulations, and the outcomes of public consultations. Based on these findings

and the specific recommendations provided by local residents and stakeholders, the report proposes enhancement measures and mitigation measures.

3.6 Project's Impact Evaluation and Prediction

3.6.1 Evaluation of Impacts

The prediction of potential impacts for the proposed project was conducted through a systematic analysis of topographic data, evaluating the interface between project activities and existing environmental and physical resources-including infrastructure, hydrological systems, human settlements, and forest cover. This assessment integrated quantitative data with expert judgment, the latter being informed by empirical evidence and comparative analyses of analogous projects.

Comprehensive field inventories were executed prior to implementation to establish a robust environmental baseline. These baseline conditions served as the primary benchmark for assessing potential changes across both spatial and temporal dimensions. Impacts were evaluated based on their Magnitude, Extent, and Duration, utilizing standardized environmental prediction methodologies. The scope of this analysis was confined to defined temporal periods and specific geographic influence zones, with consequences interpreted within local, regional, and national contexts. Both beneficial and adverse significant impacts were identified relative to the project components and their respective impact zones.

Table 3-VIII: Impact rating criteria

Impact Attribute	Classification	Description	Score
Magnitude	High (H)	Serious adverse impacts that cannot be mitigated; resource value is reduced far below publicly acceptable levels, affecting subsistence or commercial use.	60
	Medium (M)	Moderate to minor unmitigated impacts where resources remain usable, though they cause public inconvenience.	20
	Low (L)	Minimal impacts resulting in low levels of public inconvenience.	10
Extent	Regional (R)	The zone of influence extends beyond the watershed to a larger geographic region.	60
	Local (Lo)	The impact of the work extends to the watershed.	20
	Site-Specific (SS)	The impact is confined entirely to the immediate project site.	10
Duration	Long-Term (LT)	Impacts that persist for more than 20 years.	20
	Mid-Term (MT)	Impacts that continue for more than 4 years but less than 20 years.	10
	Short-Term (ST)	Temporary impacts that last for 4 years or less following project initiation.	5

Source: EPR, 2020

3.6.2 Determination of significance of the Impact

The cumulative impact score is derived from the summation of values for magnitude, extent, and duration, resulting in a range between a minimum of 25 and a maximum of 140. Numerical values presented in parentheses denote the impact scores assigned in accordance with the National EIA Guidelines (1993).

To determine the overall environmental significance of a project activity, these aggregate scores are classified into three distinct categories as follows:

Table 3-IX: Determination of Level of Significance

Cumulative Score	Significance Level
Greater than 75	Highly Significant
45 to 75	Significant
Less than 45	Less Significant

3.7 Public Hearing and Public Notice

Public Hearing

In compliance with Rule 6 of the Environment Protection Rules (EPR) 2020, a public notice was published in the Aarthik Abhiyan national daily on Kartik 30, 2082 (Sunday, 16 November, 2025). This notice was also displayed on notice boards at municipality office and all affected ward offices, community forest offices, and health posts. Furthermore, public notices were published in NOC's website prior to the event to encourage attendance. In addition, request letters were sent to the relevant government line agencies to invite their participation in the program, with the date, venue, and time clearly specified. Formal deeds of inquiry were collected to verify these postings. As per the notice published, the public hearings were held in Mechinagar Municipality Assembly Hall and at proposed Green Field Terminal, Charali on 23rd Nov, 2025 (BS: Mangsir 7, 2082) in the morning and afternoon respectively. These sessions were chaired by Mechinagar Municipality's Mayor in presence of Deputy-Mayor, affected Ward-Chairpersons, local residents. All feedback was recorded in the official minutes, with a summary of issues provided in Annex IV.

Table 3-X: Public Hearing Details

S.N	Public Hearing Date	Location	Participants		
			Male	Female	Total
1.	2082/08/07	Mechinagar Municipality Hall	47	9	53
2.	2082/08/07	NOC pipeline construction site office	50	13	63
3.	2082/08/08	Mechinagar Municipality Meeting hall	25	7	32

Seven Days Public Notice

Pursuant to Rule 7(2) of the EPR 2077, a seven-day public notice was published in the 'The Borderland', a local daily newspaper published in Jhapa, on 2082/08/16 BS (2 December 15, 2025), as shown in Annex IV. The copies of the notice were also posted on the office notice

board and official proofs of deed (Muchulkas) were collected (Annex IV). The notice included a brief overview of the project and a formal request for stakeholders to submit comments and suggestions to the Project Head Office or the EIA conducting consultant, Redknot Engineering Consultant Pvt. Ltd. within seven days.

3.8 Recommendation Letter

Recommendation letters were collected from Mechinagar Municipality and affected wards, division and sub-division forest office and other concern stakeholders along with feedbacks and suggestions. The recommendation letters are attached in Annex VII.

3.9 Final Report Preparation

The physical, chemical, biological, socio-economic, and cultural baseline environmental conditions of the proposed pipeline project area have been identified, and the significance of potential environmental impacts has been evaluated. During the public hearing, the findings of the study were presented to the relevant stakeholders within the project area. Their comments, concerns, and suggestions were integrated into the Environmental Impact Assessment (EIA) report, which has been prepared in accordance with the format prescribed by the Environment Protection Rules, 2077 (2020). This EIA report is hereby submitted to the Ministry of Forests and Environment for approval through the Ministry of Industry, Commerce and Supplies.

CHAPTER 4: REVIEW OF POLICIES, ACTS, RULES, DIRECTIVES, AND STANDARDS

In the context of the proposed project, the following are the legal and policy provisions attracted during the preparation of the Environmental Impact Assessment (EIA), as well as the commitments made by the project to be followed during its construction and operation phases

4.1 Constitution of Nepal

Article	Provision
Article 30	<p>Right to Clean Environment: It includes three parts.</p> <p>According to part 1, each person shall have the right to live in a healthy and clean environment.</p> <p>According to part 2, the victim of environmental pollution and degradation shall have the rights to be compensated by the pollutant provided.</p> <p>According to part 3, it shall not be deemed to obstruct the making of required legal provisions to strike a balance between environment and development for the use of national development works.</p>
Article 34	<p>Right to Labor: Ensuring the right to fair labor practices for every laborer, it further guarantees every laborer the right to appropriate remuneration, benefits, and contribution-based social security.</p>
Article 51	<p>Policy regarding the conservation, management and use of natural resources</p> <ul style="list-style-type: none"> • The State shall pursue policy of making sustainable use of biodiversity through the conservation and management of forests, fauna and flora and by minimizing the negative impacts of industrialization and physical development by promoting public awareness on environmental cleanliness and protection. • The State shall pursue a policy of keeping an environment balance. • The State shall pursue a policy of adopting appropriate ways of minimizing or stopping negative impacts on environment if it is there, or if there is a possibility of such an impact on nature, environment or biodiversity. • The State shall formulate policies and enact laws on the basis of the principle of sustainable environment development based on pre-warning and pre-informed agreements regarding environmental protection. Those people who pollute the environment shall have to be responsible for their action.

4.2 Environmental Policies and Strategies

S.N	Chapter/Section	Provision
1.	2.	National Environment Policy, 2019

Section 8 Sub-section 8.1	To ensure the prevention, control, and mitigation of all types of pollution, the use of environment-friendly technology shall be encouraged in the operation of industries, factories, hospitals, and transport vehicles.
Section 8 Sub-section 8.3	Necessary arrangements shall be made to maintain a clean and healthy environment. Those responsible for environmental pollution shall be required to provide fair compensation to the communities affected by the resulting environmental impacts.
Section 8 Sub-section 8.5	While developing physical infrastructure, environment-friendly structures shall be constructed, and highly sensitive areas shall be protected and managed sustainably.
National Occupational Safety and Health Policy, 2076 (2019)	
With a long-term vision to ensure the right of workers to work in a safe and healthy environment and to increase productivity, this policy aims to ensure a safe workplace through the adoption and practice of occupational safety and health standards and measures.	
Strategy 1	Policy and legal reforms, as well as amendments related to Occupational Safety and Health (OSH), shall be carried out.
Strategy 2	Regulation and promotion shall be undertaken to ensure a safe and healthy workplace.
Strategy 3	The capacity building of stakeholders related to Occupational Safety and Health shall be enhanced.
Strategy 4	Collaboration and coordination among relevant agencies shall be maintained regarding OSH monitoring, inspection, study, and research.
National Policy for Disaster Risk Reduction (DRR), 2075 (2018)	
Section 7 Sub-section 7.5	Identifying the probable road accident areas based on the disaster assessment and mapping, disaster prone areas will be decided and such information will be disseminated to the public to reduce the accidents.
Section 7 Sub-section 7.6	Disaster risk assessment and mapping shall be conducted and disseminated regarding the potential impacts of disaster risks on infrastructure-including education, health, agriculture, industry, tourism, energy, housing, transport, water supply, and sanitation-as well as on historical and cultural heritage.
National Biodiversity Strategy, 2057 (2002)	
Chapter 5, Strategy 1	Protection of Biological Diversity: Focuses on the conservation of ecosystems, species, and genetic resources both within and outside protected areas.
Chapter 5, Strategy 2	Sustainable Use of Biological Resources: Mandates that biological resources are used in a manner that does not lead to long-term decline, maintaining potential for future generations.
Chapter 5, Strategy 3	Fair and Equitable Benefit Sharing: Ensures that benefits arising from the use of genetic resources and traditional knowledge are shared fairly with local communities.

	Section 6.1	Forest Biodiversity: Promotes community-based forest management and the protection of forest-dependent flora and fauna.
	Section 6.2	Agricultural Biodiversity: Emphasizes the conservation of agro-ecosystems and the protection of indigenous crop varieties and soil fertility.
	Section 6.3	Wetland Biodiversity: Requires the protection of rivers, lakes, and marshes to maintain water quality and aquatic habitats.
	Chapter 8	Public Participation & Indigenous Knowledge: Recognizes the role of local people and traditional knowledge in conservation and ensures their participation in decision-making.
Waste Management National Policy, 2079 (2024)		
With the goal of ensuring the citizens' right to live in a clean and healthy environment, a vision has been adopted to establish a clean, healthy, and prosperous society through the proper management of waste.		
	Section 9 Sub-section 9.3	To make the use of disposal sites sustainable by minimizing waste at the source.
	Sub-section 9.4	To enhance civic responsibility in waste management.
National Climate Change Policy, 2076 (2019)		
	Section 8 Sub-section 8.5	The concept of climate-resilient economic development will be adopted by developing reliable, sustainable, and low-carbon technology-based industries, transportation, and physical infrastructure.
	Sub-section 8.6	While making the tourism sector climate-friendly, important natural, cultural, and social heritage sites will be protected and developed.
	Sub-section 8.7	A healthy living environment will be created by minimizing the adverse effects of climate-induced disasters on human health.

4.3 Acts

S.N.	Section/Sub Section	Provision
1.	Environment Protection Act, 2076 (2019)	
	Section 3: Sub-section (1)	Provision Relating to Environmental Study Reports: The proponent must prepare a formal report (BES/IEE/EIA) based on the project's scale before any construction begins.
	Section 3 Sub-section (3.1)	The environmental study report prepared in this manner must be submitted to the concerned body for approval.
	Section 4 Sub-section (1)	While preparing the environmental study report, the proponent must conduct a detailed analysis of the potential adverse impacts on the environment during the implementation of the proposal and the various alternatives that can be adopted for their mitigation. Based on these, the proponent must recommend the proposal for implementation, providing specific grounds and reasons for selecting a particular alternative.

S.N.	Section/Sub Section	Provision
	Section 8	No proposal shall be implemented, or caused to be implemented, without getting the Environmental Study Report approved.
	Section 13	If a project is implemented without an approved report or in a manner contrary to the approved report, the concerned body may immediately stop the implementation of such project.
	Section 15 (2)	No one shall cause pollution in a manner that creates a significant adverse impact on public life, public health, and the environment.
	Section 15 (4)	The Department of Environment may issue directives to any person, group, or organization to adopt pollution mitigation or elimination measures, set necessary conditions, or prohibit activities that cause adverse environmental impacts.
	Section 35	If any work is performed or caused to be performed [in violation of the Act], penalties and fines shall be imposed as per the sub-sections of this section.
2.	Public Road Act, 1974	
	Article 3A	Construction of permanent structures (building) is prohibited within the right of way of road. If it is required to acquire any land for the development, expansion or improvement of public road, the project can acquire the land in accordance with the law relation to the acquisition of land adopting compensatory measures (Article 14 and 15).
	Article 16	Article 16 has the provision to maintain greenery along the road side. Article 16 has the provision for the extraction of construction material required for development of road with adoption of compensation measure.
3.	Nepal Petroleum Act, 2040 (1983)	
	<p>According to this act, GoN has right to declare any area as prohibited area for petroleum operations for reasons of national security, public interest, historical importance or tourism development. GoN hold right to conduct all kinds of geological exploration or grant permits to any person for the exploration or production of minerals other than petroleum within an area subject to a petroleum agreement provided such activities so not in any way interfere with petroleum operations.</p> <p>This act states that if any land is required on either a temporary or permanent basis for conducting Petroleum Operations such land may be used or acquired as follows: (1) If the land belongs to His Majesty's Government, such land may be placed at the Contractor's disposal in consideration of a reasonable surface rent fixed by His Majesty's Government. If the land is privately owned, His Majesty's Government may, after acquiring the land on either temporary or permanent basis in accordance with the prevailing law at the Contractor's cost, allow the Contractor to make use of such land.</p> <p>(2) If any specific land is required for installing temporarily any equipment, tools or machinery or to conduct survey or any other works related to it in connection with</p>	

S.N.	Section/Sub Section	Provision
		<p>Petroleum Operations, then in such a case, subject to the provision of subsection (3), anyone may enter into such land to carry out any of these works.</p> <p>(3) If the performance of Petroleum Operations by His Majesty's Government or a Contractor causes disturbance of the rights of the lawful owner or damage to crops, trees, buildings, or any other property, His Majesty's Government shall, by itself or by realizing from the Contractor, pay such compensation as may be determined in accordance with the prevailing law.</p> <p>The set of rules to be followed by Contracts stated in this act are described as follows:</p> <p>His Majesty's Government may issue orders as may deem necessary to preserve national security or public interest or to prevent damage to Petroleum reservoirs, injury to person or property arising out of Petroleum Operations and to secure compliance with this Act.</p> <p>(1) If a Contractor does not comply with an order issued, His Majesty's Government may suspend Petroleum Operations so long as the Contractor does not comply with such order and if non-compliance of such order causes injury to person or property, or damage to Petroleum reservoir, His Majesty's Government may realize reasonable compensation therefor from the Contractor.</p> <p>(2) If a Contractor fails to submit any information or report to the Department as may be prescribed, His Majesty's Government may, so long as such information or report is not submitted, suspend or stop the facilities provided to the Contractor under this Act.</p> <p>(3) If a Contractor acts in contravention of any of the provisions of this Act, His Majesty's Government may either impose a fine which may extend to one hundred thousand Rupees or suspend or stop the facilities provided to the Contractor under this Act for a stipulated period.</p> <p>(4) Before initiating any action under sections (1), (2), (3) or (4), His Majesty's Government shall provide to the concerned person a reasonable opportunity for submitting his clarification.</p> <p>(5) Any person, who without reasonable excuse obstructs, molests or hinders any Contractor from undertaking Petroleum Operation under a Petroleum Agreement or any authorized act under this Act, shall be liable to imprisonment for a term which may extend to six months or fine which may extend to one thousand Rupees or with both by an order of the authority specified by His Majesty's Government in a notification published in the Nepal Gazette.</p> <p>(6) Any person not satisfied with the penalty imposed under sections (1), (2), (3), (4) or (6) may appeal to the Zonal Court within thirty-five.</p>
4.	Act Relating to Children, 2075 (2018)	
	Section 7 Sub-section (9)	Children below fourteen years of age shall not be deployed in any hazardous work or used as a domestic worker.
5.	Consumer Protection Act, 2075 (2018)	
	Section 3 Sub-section (1)	Every consumer shall have the right to obtain quality goods or services.

S.N.	Section/Sub Section	Provision
	Section 7 Sub-section (1a)	Quality goods or services must be produced/provided
	Section 16 Sub-section (1)	No one shall carry out, or cause to be carried out, any unfair trade or business activities.
6.	Right to Employment Act, 2075 (2018)	
	Section 4 Sub-section (3)	No person shall be allowed to force, compel, or coerce any citizen to engage in employment against their will or in a job they do not desire.
	Section 6	No person shall discriminate against an unemployed individual regarding the provision of employment based on their origin, religion, color, caste, ethnicity, gender, language, region, ideological conviction, or any similar grounds, except in cases where prevailing laws have made special provisions for a specific class or community (i.e., reservation/affirmative action).
	Section 7 Sub-section (1)	A person currently in employment shall not be removed from their job without a valid reason, except as provided by the prevailing laws.
	Section 3 Sub-section (1)	The privacy of matters relating to the physical and mental health of every person shall be inviolable (cannot be infringed upon).
	Section 12 Sub-section (2)	While collecting the personal or family data of any individual, his or her consent must be obtained.
7.	National Disaster Risk Reduction and Management Act, 2017	
	Section 10 Sub-section (2)	Public institutions and business establishments must formulate and compulsorily implement a Disaster Management Plan in accordance with the disaster management plans of the Government of Nepal, Provincial Government, and Local Level.
	Section 11 (1), Point (na, ण)	To raise, or cause to be raised, public awareness regarding disaster risk reduction.
	Section 20 Sub-section (1)	All public institutions and business establishments must make necessary arrangements in their buildings, industries, offices, or business centers to prevent disaster incidents. This includes providing disaster safety tools, equipment, materials, emergency exits, and other specified arrangements. Additionally, they must provide basic orientation and training on disaster management to their employees and workers as prescribed by the Authority (NDRRMA). If their buildings or other structures are required for emergency purposes, they must be made available upon order. These institutions must also ensure proper management of waste and pollution and adopt measures to minimize any negative impacts on the environment and public life.
8.	Labour Act, 2074 (2017)	

S.N.	Section/Sub Section	Provision
	Section 3 Sub-section (2)	Any employment agreement between an employer and a laborer that provides for remuneration or benefits less than those mentioned in this Act or its rules, or that contradicts the conditions specified herein, shall be deemed contrary to this Act and shall be void to that extent.
	Section 4 Sub-section (1)	No laborer shall be engaged in forced labor, either directly or indirectly.
	Section 5	No person shall engage any child in work in a manner that is contrary to the law.
	Section 6 Sub-section (1)	An employer shall not discriminate against laborers on the grounds of religion, color, sex, caste, ethnicity, origin, language, ideological conviction, or any other similar grounds.
	Section 7 Sub-section (1)	There shall be no discrimination in remuneration between laborers for work of equal value based on gender.
	Section 8 Sub-section (1)	Subject to this Act and other laws, every laborer shall have the right to form and operate a trade union, obtain membership in such a union, or be affiliated with it and participate in other trade union activities.
	Section 11 Sub-section (1)	No employer shall engage any person in work without executing an employment agreement.
9.	Local Government Operation Act, 2074 (2017)	
	Section 11 Sub-section 2	<p>Powers and Functions of Local Government: The local government is empowered to formulate policies regarding revenue collection. Subject to federal and provincial laws, it provides for the fixing, implementation, and monitoring of house and land rent tax, vehicle tax, tourism tax, business tax, and land tax.</p> <p>The same section grants the local government the authority to formulate policies regarding environmental protection and biodiversity. It assigns responsibility to the local level for environmental risk reduction, pollution control, and the regulation of hazardous materials.</p>
10.	Sexual Harassment at Workplace (Prevention) Act, 2071 (2014)	
	Section 3	No person shall commit, or cause to be committed, sexual harassment at the workplace.
	Section 12	If any person is found to have committed sexual harassment against an employee or a service seeker (client/customer), such person—depending on the nature of the offense—shall be punished with imprisonment for up to six months, or a fine of up to fifty thousand rupees, or both.
11.	Solid Waste Management Act, 2068 (2011)	
	Section 3	The responsibility for waste management is assigned to the local levels (Municipalities/Rural Municipalities). Under this, the

S.N.	Section/Sub Section	Provision
		local level is responsible for the construction and operation of infrastructure required for collection, final disposal, and processing.
	Section 4	The responsibility for processing and managing hazardous waste, medical (healthcare) waste, chemical waste, or industrial waste-subject to prescribed standards-lies with the individual or entity that generates such waste.
	Section 6	Waste must be segregated at the source into at least different types, including organic (biodegradable) and inorganic (non-biodegradable).
	Section 7	The authority to determine the time, location, and method for waste disposal rests with the concerned local level.
	Section 10	The local level is designated as the responsible body for arranging and promoting activities related to waste reduction, reuse, and recycling.
	Section 38	If anyone performs any act contrary to waste management regulations, it shall be considered an offense under this Act.
	Section 39	For offenses committed under this Act, a person may be punished with a cash fine ranging from NPR 500 to NPR 100,000, and imprisonment for up to three months.
12.	Child Labour (Prohibition and Regulation) Act, 2056 (2000)	
	Section 3 Sub-section (1)	It is prohibited to engage any child who has not completed fourteen years of age in labor.
	Sub-section 2	It is prohibited to engage a child in hazardous occupations or work (as defined by the Schedule of the Act).
13.	Aquatic Animal Protection Act, 1960	
	Section 3	Act renders punishment to any party introducing poisonous, noxious or explosive materials into the water source or destroying any dam, bridge or water system with the intent of catching or killing aquatic life.
	Section 4	Empowers the government to prohibit catching, killing and harming certain kinds of aquatic animals through notification in the Nepal Gazette.
14.	Water Resources Act, 2049 BS (1992)	
	The Water Resource Act, 2049 is a comprehensive legislation on water resources. It deals with the development, utilization and conservation of the water resources in the country. The Act states that the State is the owner of water resources of the country. This Act grants right to use water by individuals, organizations and private sector. The Act provides the priority orders to be followed while utilizing the water resources.	
	Sections 18	Allow the Government to prescribe pollution tolerance limits and water quality standards for various uses.
	Sub-section 2 of Section 19	Prohibits anyone from polluting water resources to the effect at the prescribed tolerance limits are exceeded.

S.N.	Section/Sub Section	Provision
	Section 20	States that “while utilizing water resources, it shall be done in such a way that no significant adverse effect be made on the environment by the way of soil erosion, flood, landslide, or similar other cause”.
15.	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Act, 2073 (2017)	
		Convention on International Trade of Endangered Species of Wild Fauna and Flora, CITES Act, 2073 has been enacted by Government of Nepal for the implementation of CITES, 1973. This act requires the state to protect of endangered flora and fauna listed in CITES. This act was formulated on the basis of Sub-Article 1 of Article 296 of the Constitution of Nepal for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 2030. The main objective of this act is to protect the endangered flora and faunal species and monitor and control the international trade of those species. According to this Act, the species enlisted in Appendix I of CITES is stated as Rare Flora and Fauna, Appendix II is stated as Threatened Flora and Fauna and Appendix III is stated as Protected Flora and Fauna species.

4.4 Rules and Regulations

S.N.	Rule Section	Description
1.	Environment Protection Rules, 2077 (2020)	
	Rule 3	A project proponent must conduct the specific type of study based on the project's scale and nature as listed in the Schedules: Schedule 1: Brief Environmental Study Schedule 2: Initial Environmental Examination Schedule 3: Environmental Impact Assessment
	Rule 4	Before preparing an EIA report, the proponent must determine the scope of the study (identifying the boundaries and key issues to be analyzed).
	Rule 5	The proponent must prepare a Terms of Reference (ToR) before drafting the EIA report. This acts as a roadmap for what the study will cover.
	Rule 6	During the preparation of an EIA report, the proponent must conduct a public hearing in the area affected by the project to collect feedback and suggestions from local stakeholders.
	Rule 7 (2, 3)	To gather suggestions from locals and stakeholders: <ul style="list-style-type: none"> • Notice must be posted in public places. • A 7-day public notice must then be published in a national daily newspaper.
	Rule 13	The project proponent must commence the implementation of the project within three years from the date the EIA report is approved.
2.	Disaster Risk Reduction and Management Rules, 2076 (2019)	

	Rule 3	The implementation of integrated and sectoral policies, plans, and strategic plans shall be monitored in coordination with the relevant bodies and stakeholders at the Federal, Provincial, District, and Local levels.
3.	Labor Rules, 2075 (2018)	
	Rule 16	Working hours must be determined according to the nature of the work.
	Rule 34	Guidelines must be formulated regarding Occupational Health and Safety (OHS) risks, with an emphasis on identifying potential risks that could occur at the workplace.
	Rule 39	Protective arrangements must be adopted for risks such as; eye injuries (from sparks, dust, or flying debris), chemical impacts (exposure to hazardous liquids or fumes), fire hazards (prevention and emergency response).
	Rule 53	Employers must provide laborers with: <ul style="list-style-type: none"> • Personal Protective Equipment (PPE) (e.g., helmets, gloves, boots, and masks). • First Aid facilities (accessible medical kits and trained personnel).
4.	Contribution-based Social Security Rules, 2075 (2018)	
	Rule 3	Persons receiving salary and benefits from the Government of Nepal's fund shall be entitled to participate in the social security schemes as prescribed under Section 10 of the Contribution-based Social Security Act.
	Rule 4	Workers in the informal sector and self-employed individuals shall also be entitled to participate in the social security schemes.
	Rule 5	An agreement may be entered into with any bank or financial institution for the collection of the amounts to be deposited into the Social Security Fund (SSF) according to the social security scheme.
5.	Solid Waste Management Rules, 2070 (2013)	
	Rule 3 (2)	Provisions shall be made to collect hazardous and chemical waste separately, and to segregate organic (biodegradable) and inorganic (non-biodegradable) waste at the source. The responsibility for managing hazardous and chemical waste shall rest with the generator (producer) of such waste.
	Rule 5	Hazardous, chemical, organic, and inorganic waste must not be mixed together. If such wastes happen to be mixed, the collection, storage, and management of the entire mixed batch must be carried out with extreme caution.
	Rule 24 (2)	The local level (Municipality/Rural Municipality) may issue orders to waste generators regarding: <ul style="list-style-type: none"> - Reducing and minimizing waste production at the source. - Timely payment of waste management fees. The waste generator must comply with such orders issued by the local body.

	Rule 25	Necessary arrangements have been made regarding the monitoring of waste management activities to ensure compliance with the Act and Rules.
6.	Child Labor (Prohibition and Regulation) Rules, 2006	
	Rule 4 (1)	Before engaging a child as a laborer, the establishment must submit an application to the Labour Office to determine whether the child is physically and mentally fit for the work. The application must explicitly mention: <ul style="list-style-type: none"> - The nature of the work to be performed. - The age of the child.
	Rule 6	A child working in an establishment shall receive a monthly salary and allowances that are not less than the minimum remuneration and allowances fixed by the Government of Nepal through a notification published in the Nepal Gazette (as per the Labor Act).
7.	Petroleum Regulation, 2041 (1985)	
	Any contractor desiring to conduct Petroleum Operation shall issue invitation for bid and public notice thereto, in national or international newspaper prescribing a time limit of at least sixty days for the submission of bids.	
	Chapter 2 (3)	In case Government desires to conduct Petroleum Operations by employing a Contractor, Department shall issue an invitation for bid and publish notice thereto, in national and international newspapers prescribing a time limit of at least sixty (60) days for the submission of bids.
8.	Hazardous Materials and Waste Management Rules, 2077 (2020)	
	Rule 3	Proponents must ensure that hazardous waste is not mixed with non-hazardous or general waste. It must be collected and stored separately in a manner that prevents reaction or contamination.
	Rule 4	The person or entity generating the waste (the "Occupier") is legally responsible for its safe management—from generation to final disposal. This includes ensuring that the waste is handled by authorized personnel only.
	Rule 6	No person or institution shall collect, transport, store, or dispose of hazardous waste without obtaining an authorization/license from the Department of Environment or the designated authority.
	Rule 10	Every establishment generating hazardous waste must develop and implement a Standard Operating Procedure (SOP) for its internal management, including emergency response plans for spills or leaks.
	Rule 17	Container Integrity: Hazardous materials must be kept in leak-proof, non-reactive containers. Warning Labels: Every container must bear a clear, legible label identifying the hazardous substance, its associated risks (Flammable, Toxic, etc.), and first-aid instructions.

	Rule 18	The transport of hazardous waste must be done in specially designed vehicles. It is strictly prohibited to transport hazardous waste in public transport or standard garbage trucks.
	Rule 19	A formal manifest (tracking document) must be prepared for the movement of waste. The sender must prepare multiple copies (usually 7) to be signed by the transporter and the receiver. This ensures a "cradle-to-grave" tracking of hazardous materials to prevent illegal dumping.
	Rule 20	Establishments must maintain a daily record of the hazardous waste generated, stored, and disposed of. This record must be made available to government inspectors upon request.
9.	Petroleum Products and Gas Price Stabilization Fund (Operation) Rules, 2071 (2015)	
	Rule 3	This rule officially establishes the Price Stabilization Fund (PSF). It mandates that the fund be used to manage and stabilize the retail price of petroleum products (petrol, diesel, kerosene, aviation fuel) and Liquefied Petroleum Gas (LPG) when international prices fluctuate excessively.
	Rule 4	This rule identifies where the money in the fund comes from. Key sources include: Price Levies: A specific amount collected per liter/cylinder from consumers (e.g., 50 paisa per liter of petrol). NOC Contributions: A portion of the profits from Nepal Oil Corporation during periods of low international prices. Government Grants: Any seeds or grants provided by the Government of Nepal. Interest: Interest earned from the fund's deposits in commercial banks.
	Rule 5	This is the most critical rule for market operations. It states that the fund can only be used to: Compensate NOC when the international purchase price from Indian Oil Corporation (IOC) is higher than the domestic selling price. Prevent sudden, sharp hikes in the retail price of fuel for the general public. Repay loans taken by NOC for the import of petroleum products during financial crises.

4.5 Environmental Directives, Procedures, and Guidelines and Standards

S.N.	Directives, Procedures, and Guidelines and Standards					
1.	Nepal Vehicle Emission Standard, 2082 (2025)					
	S. N.	Types of Vehicle	Pollution Maximum Limit (mg per Kilo Meter)			
	1.		Carbon Monoxide (CO)	Total Hydrocarbon	Nitrus Oxide (NO _x)	Particulate matter (PM)
	2.	Two wheeler vehicles				
		Light two wheeler vehicle (L1)	500	350	150	-
		Two wheeler vehicle (L3)	1000	100	60	4.5
	3.	Passenger carrying four wheeler vehicle				
		Small passenger carrying vehicles (M1)	1000	100	60	4.5
		Medium passenger carrying vehicles (M2)				
	4.	Small Goods Carrying Vehicles (N1)				
		Class I (RM ≤ 1305 Kg)	1000	100	60	4.5
		Class II (1305 Kg < RM ≤ 1760 Kg)	1810	130	75	4.5
		Class III (RM >1760 Kg)	2270	160	82	4.5
2.	National Drinking Water Quality Standards, 2079					
	The Government of Nepal, exercising the power conferred by Sub-section (1) of Section 18 of the Water Resources Act, 1992 (2049 BS), has prepared and implemented the National Drinking Water Quality Standards (NDWQS). The various parameters specified in the standards and their respective limits are presented in the table below.					
	Category	Parameters	Unit	Maximum Concentration Limit		
	Physical	Color	TCU	5 (Acceptable up to 15)		
		Taste & Odor	-	Non-objectionable		
		Turbidity	NTU	5 (Acceptable up to 10)		
		pH	-	6.5 – 8.5		
		Electrical conductivity	μS/cm	1500		
		Total dissolved Solids	mg/L	1000		
	Chemical	Iron (Fe)	mg/L	0.3 (Acceptable up to 3.0)		
		Manganese (Mn)	mg/L	0.2		
		Arsenic (As)	mg/L	0.05		
		Fluoride (F)	mg/L	0.5 – 1.5		
Ammonia (NH ₃)		mg/L	1.5			
Chloride (Cl)		mg/L	250			
Nitrate (NO ₃)		mg/L	50			

		Total Hardness	mg/L	500 (as CaCO ₃)
		Calcium (Ca)	mg/L	200
		Lead (Pb)	mg/L	0.01
		Cadmium (Cd)	mg/L	0.003
		Chromium (Cr)	mg/L	0.05
		Mercury (Hg)	mg/L	0.001
	Microbiological	E. coli	CFU/100 ml	0
		/ Total Coliform	MPN/100ml	0 (Must be Nil)
3.	National Ambient Air Quality Standards, 2069 (2012)			
	The Government of Nepal, exercising the power conferred by Rule 15 of the Environment Protection Rules, 2054 (1997), has implemented the National Ambient Air Quality Standards (NAAQS) to regulate and maintain air quality across the country.			
	Pollutant (Indicator)	Averaging Time	Maximum Limit (µg/m ³)	Test Method
	Total Suspended Particulate (TSP)	24-hour	230	High Volume Sampling & Gravimetric Analysis
	PM ₁₀	24-hour	120	High Volume Sampling, Gravimetric, TEOM, or Beta Attenuation
	PM _{2.5}	24-hour	40	PM2.5 Sampling Gravimetric Analysis
	Sulfur Dioxide (SO ₂)	Annual**	50	Ultraviolet Fluorescence, West and Gaeke Method
		24-hour	70	
	Nitrogen Dioxide (NO ₂)	Annual**	40	Chemiluminescence
		24-hour*	80	
	Carbon Monoxide (CO)	8-hour*	10,000	Non-dispersive Infrared Spectrophotometer
	Ozone (O ₃)	8-hour	157	UV Spectrophotometer
	Lead (Pb)	Annual	0.5	High Volume Sampling & Atomic Absorption Spectrometry
	Benzene	Annual**	5	Gas Chromatographic Technique
4.	National Noise Quality Standards, 2069 (2012)			
	According to the National Noise Quality Standards, 2069, directed by the Government of Nepal, the following noise limits must be maintained. These limits are measured in Leq (Equivalent Continuous Sound Level) in decibels (dB).			
	S.N.	Area Category	Day Limit (dB)	Night Limit (dB)
	1	Industrial Area	75	70
	2	Commercial Area	65	55
	3	Rural Residential Area	45	40
	4	Urban Residential Area	55	50
	5	Mixed Residential Area	63	55

	6	Silence Zone (Hospitals, Schools)	50	40		
5.	Emission Standard for Diesel Generator Sets (Imported), 2069 (2012)					
	According to the standards directed by the Government of Nepal for smoke and pollutants emitted from Diesel Generators into the air, the following air quality and emission limits must be maintained.					
	Capacity (kW)		Carbon Monoxide (CO) (g/kWh)	HC + NO_x (g/kWh)	Particulate Matter (PM) (g/kWh)	
	kW < 8		8.0	7.5	0.8	
	8 = kW < 19		6.6	7.5	0.8	
	19 = kW < 37		5.5	7.5	0.6	
	37 = kW < 75		5.0	4.7	0.4	
	75 = kW < 130		3.0	4.0	0.3	
130 = kW < 560		3.5	4.0	0.2		
6.	Tolerance Limits for Industrial Effluent Discharged into Public Sewers, 2060 (2003)					
	As per Rule 15 of the Environment Protection Rules, 2054, the Government of Nepal has established these "Directive Standards" to regulate what industries can legally discharge into the public drain system.					
	Characteristics / Parameters			Tolerance Limit (Max)		
	Total Suspended Solids (TSS)			600 mg/L		
	pH			5.5 to 9.0		
	Temperature			45 °C		
	BOD (5 days at 20 °C)			400 mg/L		
	COD (Chemical Oxygen Demand)			1000 mg/L		
	Oils and Grease			50 mg/L		
	Mineral Oils			10 mg/L		
	Total Dissolved Solids (TDS)			2100 mg/L		
	Chloride (Cl)			1000 mg/L		
	Sulphates (\$SO_4\$)			500 mg/L		
	Ammonical Nitrogen			50 mg/L		
	Parameter	Limit (mg/L)	Parameter	Limit (mg/L)	Parameter	Limit (mg/L)
	Arsenic (As)	1.0	Mercury (Hg)	0.01		
	Cadmium (Cd)	2.0	Nickel (Ni)	3.0		
	Total Chromium	2.0	Lead (Pb)	0.1		
	Copper (Cu)	3.0	Zinc (Zn)	5.0		
	Cyanides (CN)	2.0	Phenolic Compounds	10		
	Sulphides (S)	2.0	Selenium (Se)	0.05		
Silver (Ag)	0.1	Insecticides	Absent			
7.	Tolerance Limits for Industrial Effluent (Surface Water), 2058					

The Government of Nepal, exercising the power conferred by Rule 15 of the Environment Protection Rules, 1997 (2054 BS), has implemented the following standards to serve as Directive Standards.			
Characteristics / Parameters	Tolerance Limit (Maximum)		
Total Suspended Solids (TSS)	30 to 200 mg/L		
Particle Size of TSS	Shall pass through an 850-micron sieve		
pH	5.5 to 9.0		
Temperature	Shall not exceed 40°C in the stream within 15 meters downstream from the outlet.		
BOD (5 days at 20°C)	30 to 100 mg/L		
Chemical Oxygen Demand (COD)	250 mg/L		
Oils and Grease	10 mg/L		
Phenolic Compounds	1.0 mg/L		
Cyanides (as CN)	0.2 mg/L		
Sulphides (as S)	2.0 mg/L		
Total Residual Chlorine	1 mg/L		
Fluorides (as F)	2.0 mg/L		
Ammonical Nitrogen	50 mg/L		
Insecticides	Absent		
Parameter	Limit (mg/L)	Parameter	Limit
Arsenic (As)	0.2	Silver (Ag)	0.1 mg/L
Cadmium (Cd)	2.0	Selenium (Se)	0.05 mg/L
Hexavalent Chromium (Cr^{+6})	0.1	Zinc (Zn)	5 mg/L
Copper (Cu)	3.0	Alpha Emitters	10^{-7} c/ml
Lead (Pb)	0.1	Beta Emitters	10^{-8} c/ml
Mercury (Hg)	0.01	Nickel (Ni)	3.0 mg/L

4.6 International Conventions

S.N.	Conventions	Description
	ILO Convention on Indigenous and Tribal Peoples, 1989	
	ILO Convention No.169 highlights the need to recognize indigenous and tribal people's specific knowledge, skills and technologies as the basis for their traditional economies and self-determined development process.	
	Article-1	Article-1 of the convention provides definition of the tribal and indigenous people

	Article 15	The rights of the peoples concerned to the natural resources pertaining to their lands will be specifically safeguarded. The uses of the term lands include the concept of territories, which covers the total environments of the areas that the peoples concerned occupy or otherwise use. The peoples concerned will wherever possible participate in the benefits of such activities and will receive fair compensation for any damages which they may sustain as a result of such activities.
	Article 16 (2)	Clearly mention that where the relocation of these peoples is considered necessary as an exceptional measure such relocation will take place only with their free and informed consent.
Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1973		
Nepal became party to Convention on International Trade in Endangered Species (CITES) in 1975. CITES has facilitated international co-operation to regulate international trade in endangered wild flora and fauna with the aim of reducing or eliminating trade in species whose numbers or conditions suggest that further removal from their natural habitat would lead to their extinction. The National Parks and Wildlife Conservation (NPWC) Act regulates the trade of species listed in CITES appendices. The Government has designated the Natural History Museum (Tribhuvan University) and the Department of Plant Resources as the scientific authorities for wild fauna and wild flora respectively. Similarly, the Government has designated the Department of National Parks and Wildlife Conservation and the Department of Forest as the management authorities for wild fauna and flora respectively. The Convention urges Parties not to allow trade in specimens of species included in the CITES Appendices I, II and III except in accordance with the provisions of the Convention.		
Convention on Biological Diversity, 1992		
Nepal became signatory body to the UN Convention on Biological Diversity (CBD) on 12 June 1992 and ratified on 23 November 1993. The Convention establishes three main goals: a) conservation of the world's biological diversity, b) sustainable use of its components, and c) fair and equitable sharing of the benefits from the use of these genetic resources. The convention provides a broader framework on the need for carrying out EIA to minimize adverse impacts of the projects and programs on bio-diversity. The Article 14 of the convention makes provisions for the impact assessment and minimize the adverse impacts. In broader sense, it calls upon the Parties to introduce appropriate procedures for EIA and ensure public participation, exchange information and consult on adverse effects on biodiversity of other states, notify immediately to other states in case of danger or damage to bio-diversity and initiate action to prevent or minimize such damages.		

CHAPTER 5: EXISTING ENVIRONMENTAL CONDITIONS

This chapter provides the details about the existing environmental condition in the project area. An environmental baseline survey was conducted as a part of EIA for the Siliguri-Jhapa Petroleum pipeline on Nepal Section (14.6 KM) from November- December, 2025 and secondary data were also verified during the field survey. The primary data includes ambient air quality, Noise level, Groundwater and surface water quality, soil quality, land use pattern and flora and fauna found around the project site.

5.1 Physical Environment

5.1.1 Physiography

The proposed petroleum pipeline from Siliguri, IOC Terminal, India to Jhapa Terminal, Duhagadhi, Koshi Province cross the Mechi River, and enters into Mechinagar Municipality ward 7 of Jhapa district, Nepal along the Mechi Bridge (GPS: 88° 9'44.28"E, 26°38'42.19"N-TP 123). The total length of pipeline within the Nepal territory is approximately 14.6 km and the entire length lies in Mechinagar Municipality of Jhapa District. The pipeline passes within the ROW of the East-West Highway and Mechi Highway (Bhadrapur-Ilam) for 11.736 km and 1.706 km length respectively.

5.1.2 Topography

The proposed petroleum pipeline lies in the Eastern Terai Region of Nepal. The topography of project area is characterized by plain and flat land. The pipeline alignment begins from the Kakarvitta Mechi Bridge of the Jhapa at an elevation of 123 amsl and end at Charali, Duhagadi at an elevation of 122 amsl.

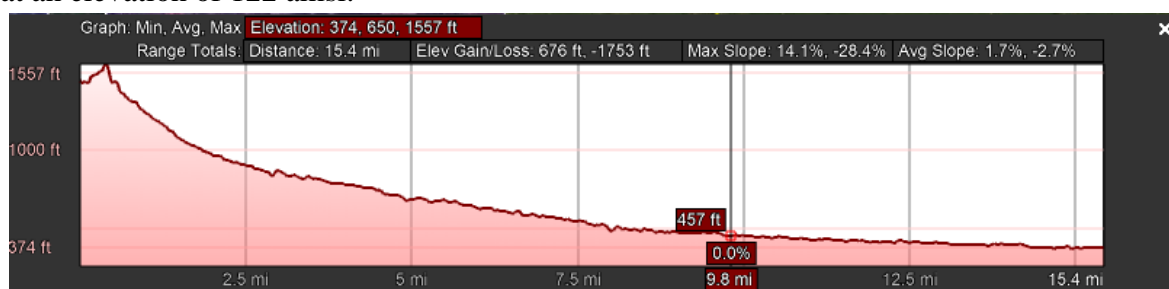


Figure 5-I: Elevation profile of Mechinagar Municipality

Source: Google Earth (retrived in Jan, 2026)

The elevation profile of Mechinagar Municipality illustrates the transition from Nepal's Chure (Siwalik) Range down to the Terai plains. Starting at 474.5 meters, the route descends through the rugged, erodible foothills of the Chure into the Bhabar zone, a porous transition belt of boulders and gravel.

By the 15.77 kilometer mark, the terrain flattens significantly to a minimum of 114 meters, the Terai region.

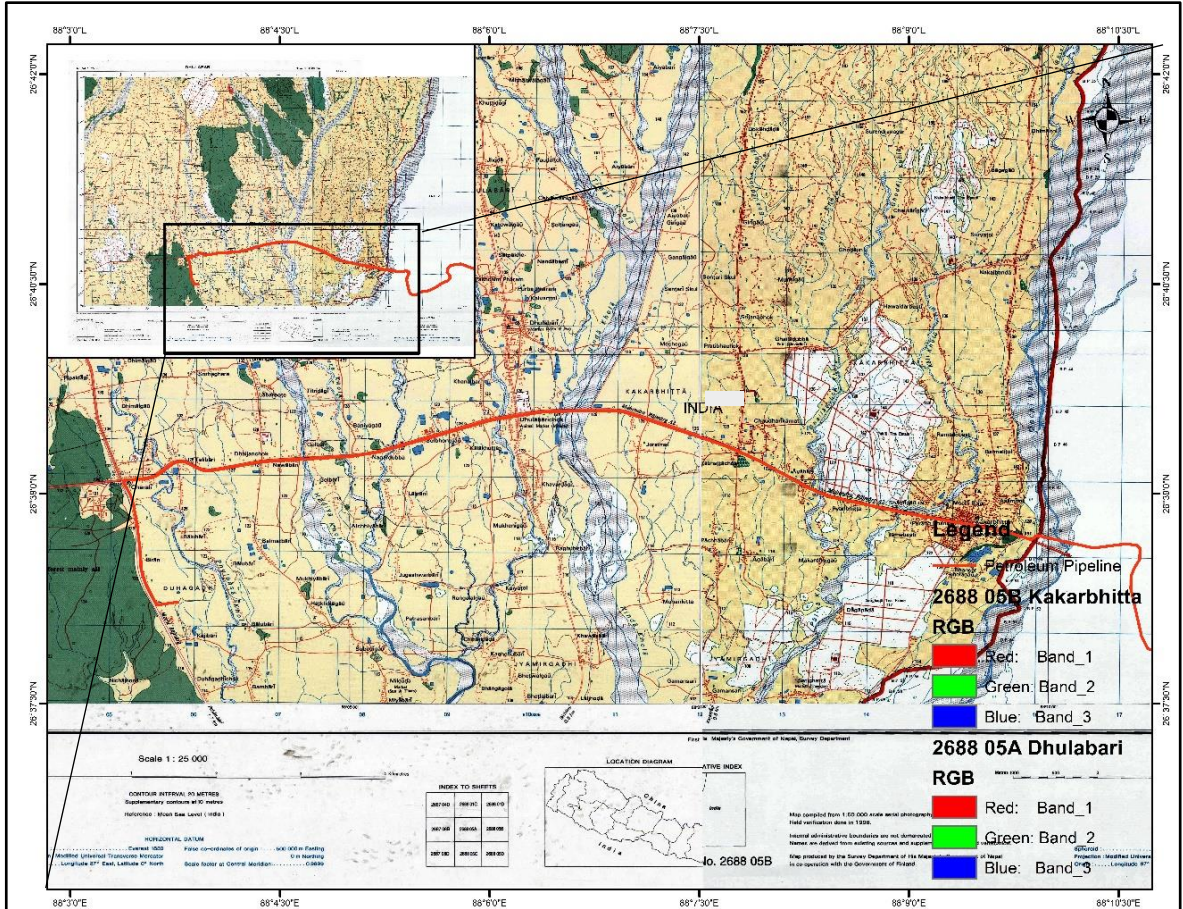


Figure 5-II: Pipeline Alignment on Topo Map

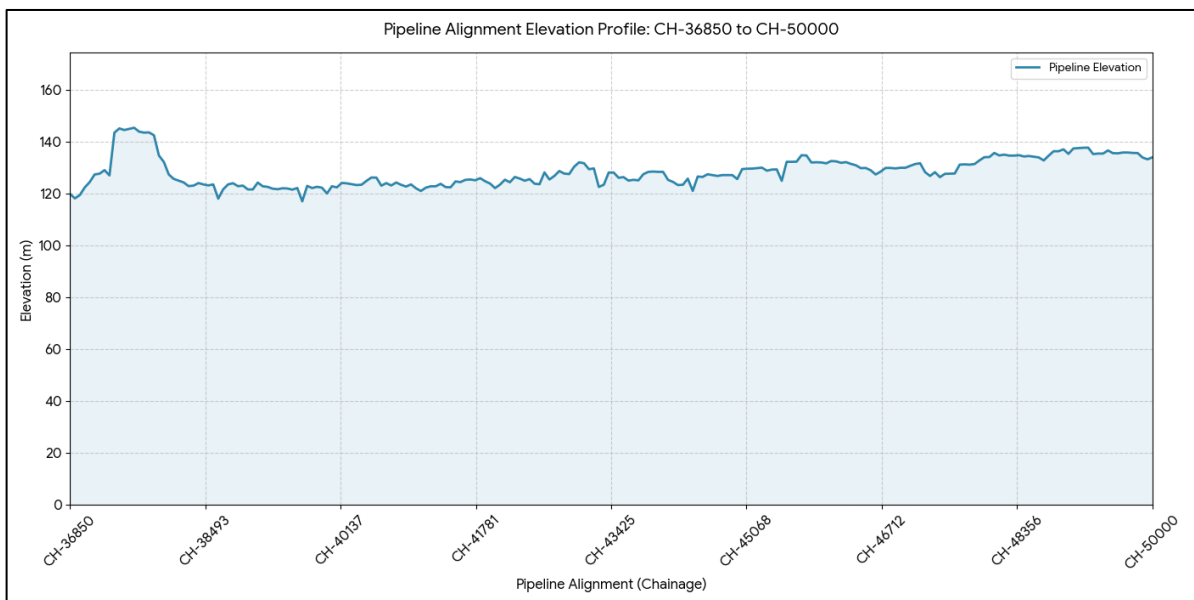


Figure 5-III: Elevation profile of pipeline alignment

Alignment Statistics:

Vertical Scale: The graph highlights that while the terrain has local undulations (fluctuating between ~117m and ~145m), the overall pipeline route maintains a relatively low and consistent elevation profile across this section.

Topographic High and Low: The most prominent peak occurs near the beginning of section, Mechi Bhansar (around CH-37600), reaching an elevation of 145.54 meters and the lowest point in this alignment is 117.15 meters, located near CH-39750.

The elevation fluctuations will require careful calculation of pressure gradients and the potential placement of air release valves at high points and drain valves at low points to maintain optimal flow.

5.1.3 Land Use pattern

Land use pattern within 100 M and 500 M buffer area of the pipeline alignment was studied through cadastral and topographic maps and verified during walkthrough survey. The major land use in the project area is covered by agricultural land, settlement, forest areas and water bodies/river. Since the pipeline traverse through the E-W highway’s RoW, which is being upgrading, the RoW (25m on both sides from center line) of road is clear. Figure 5-IV shows the land use pattern of the project area.

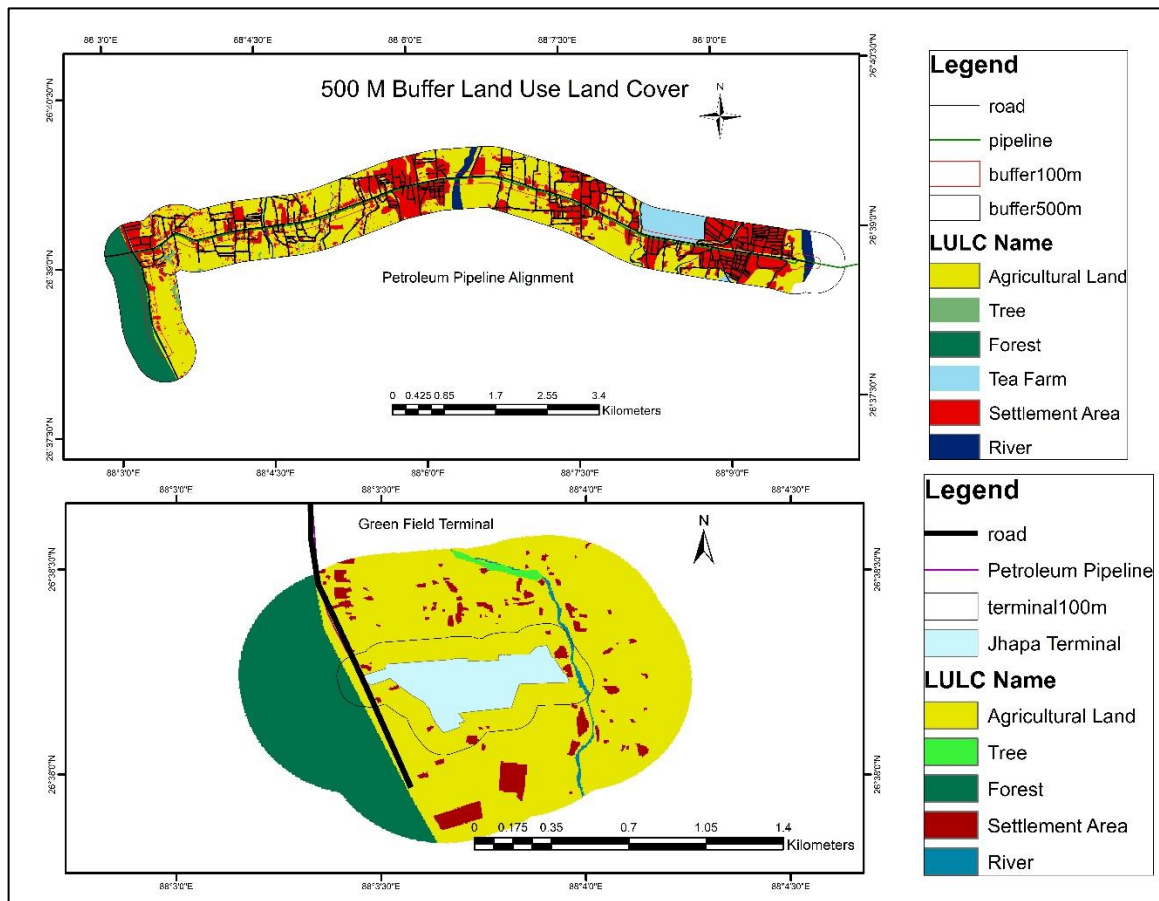


Figure 5-IV: Landuse Pattern of Project Area

The Table 5-I outlines the land use distribution across Petroleum Pipeline and a Green Field Terminal-measured at both 500m and 100m buffer zones. Agriculture Land represents the largest impacted category for both projects component, accounting for a significant majority of the total area (e.g., 670.9 hectares in the pipeline's 500m buffer). Other notable land types affected include Settlements, Forests, and Roads, which occupy substantially smaller portions of the buffer zones compared to farmland.

Table 5-I: Land use pattern

Land Use Category	Petroleum Pipeline		Green Field Terminal		Remark
	500 M Buffer	100M Buffer	500M Buffer	100M Buffer	
Agriculture Land	670.9 Hectare	83.2 Hectare	126.8 Hectare	22.6 Hectare	
Settlement	405 Hectare	5.54 Hectare	8.92 Hectare	1 Hectare	
Forest	118 Hectare	14.25 Hectare	42.42 Hectare	1 Hectare	
Tea Farms	50 Hectare	5.01 Hectare	-	-	
River / Water Bodies	36 Hectare	96 Hectare	1.34 Hectare	0.4	
Tree Area	6 Hectare	4.2 Hectare	1.08 Hectare	-	
Road	77 Hectare	67 Hectare	3 Hectare	0.75	
Total	1370 Hectare	274.2 Hectare	180.5 Hectare	25.75 Hectare	

The pipeline route begins at the Indo-Nepal border, initially traversing the Mechi River floodplains before passing through dense settlement areas near Kakarbhitta and Dhulabari. As the alignment progresses, the land use shifts to a diverse mix of agricultural land, barren fields, and specialized areas like the Tokala Tea garden. Significant natural features, including the Ninda River and the Charali Forest, flank the pipeline at various chainage intervals. The route concludes at the Green Field Terminal, where the surrounding vicinity is primarily utilized for agriculture.

Table 5-II: Land use along the pipeline alignment

S.N	Chainage	Section	Land use	Remark
1.	- 37000 (starting from Siliguri)	Indo-Nepal Border to Gairi Gaun, Near Kakarvitta Costumes	Mechi River and river flood plain.	
2.	37000-38500	Kakarbhitta- Kali Khola	Settlement area on both side of pipe alignment	
3.	38500-39500	Kali Khola-Pali Khola	Mixed settlement and barren land on the left and Tokala Tea garden on the right.	
4.	39500-42500	Pali Khola-Manab Dharma Sewa Aashram	Mixed of settlement, agriculture land and barren land	
5.	42500-42850	Ninda River	Ninda River and its flood plani	
6.	42850-44500	Ninda River-Dhulabari area	Settlement on both side of pipeline	
7.	44500-48000	Dhulabari-Charali	Both side land is mixed with agriculture and barren land with few of resident.	
8.	48000-48500	Charali Chock Area	Settlement area	
9.	48500-50000	Charali-green field terminal	Mixed land use type with residential and agriculture on the	

			left and Charali Forest on the right of the petroleum pipeline alignment.	
10.	Terminal		The land vicinity of the terminal has been used as agricultural land	

As per the Population Density Index (PDI), the whole section of Nepal falls under Zone III which requires high grade pipeline materials and advance safety factors.

5.1.4 Air Environment

Relative Humidity

The box plot illustrates the monthly distribution of Relative Humidity from 2021 to 2025 of Chandragadhi Airport located about seven kilometer to south of the proposed terminal site. The vertical whiskers extend to show the full range of variability, highlighting seasonal shifts. Typically, the plot reveals lower, more stable humidity in spring and a significant rise toward a late-summer peak, providing a clear visual summary of regional climate patterns.

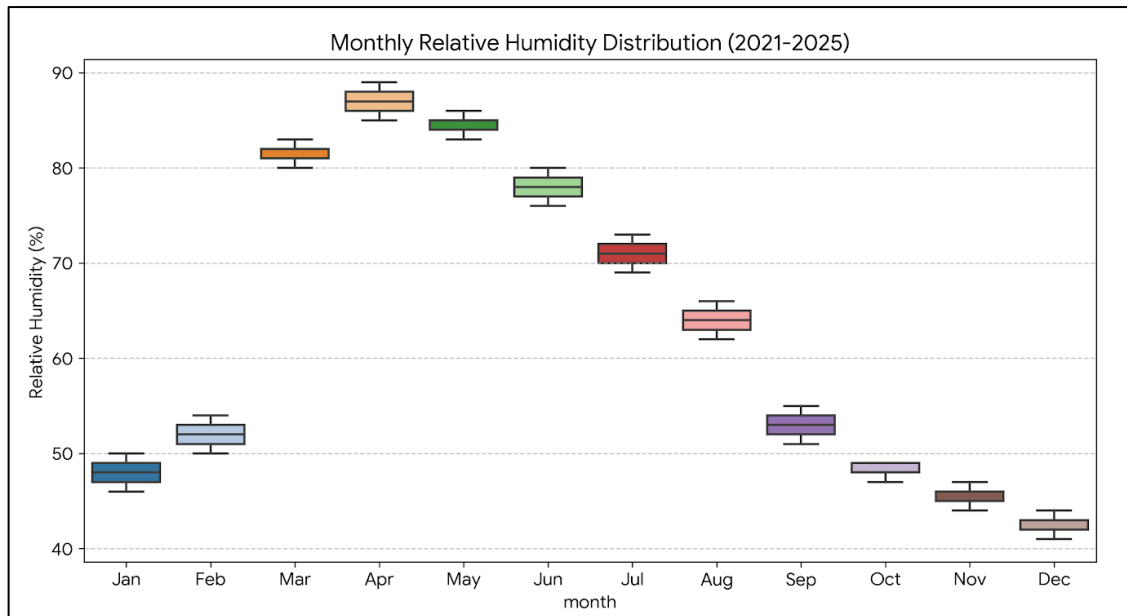


Figure 5-V: Monthly Humidity of Project area

Source: DHM Station Chandragadhi, Jhapa

Result

Distinct Seasonal Variability: The plot reveals a clear cyclical pattern, with humidity levels starting at a moderate 45-50% in January, dipping to their lowest points in early spring, and then climbing sharply as the summer progresses.

Peak Humidity Period: The months of July and August consistently exhibit the highest relative humidity, with medians frequently exceeding 80% indicating that high humidity is very consistent during this peak season.

Temperature

The temperature data were taken Chandragadi Airport in the Jhapa district, identified by the station index 141201. The spatial details are provided with latitude of 26.570391, a longitude of 88.075144, and an elevation of 95.

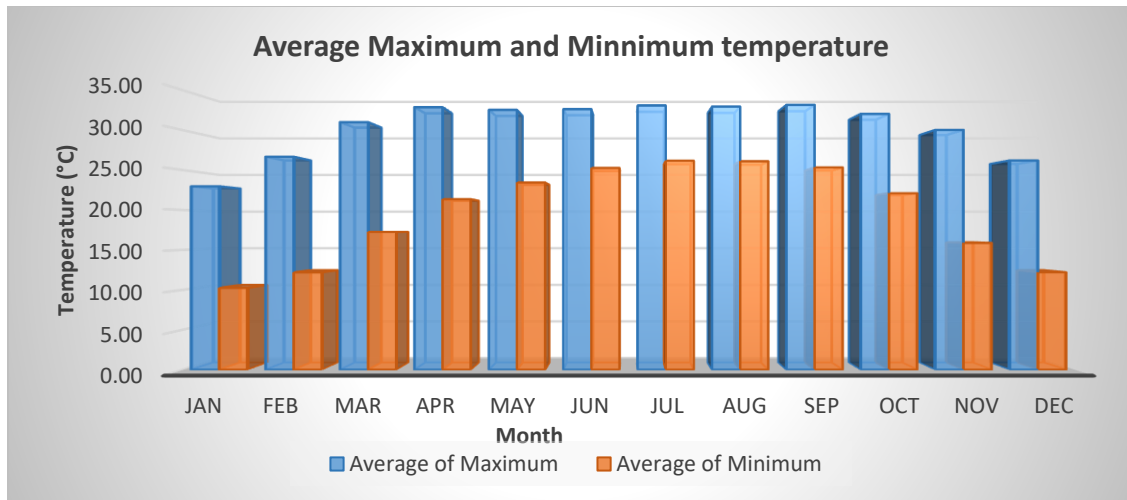


Figure 5-VI: Five year Monthly Temperature

The column chart illustrates the average monthly maximum and minimum temperatures throughout the year of period 2020 to 2025. The average maximum temperatures, which peak during the summer months from April to September at approximately 30°C to 33°C. The average minimum temperatures, showing a significant rise from a low of around 10°C in January to a peak of about 25°C in July. Overall, the temperature data reveals a seasonal trend where both maximum and minimum temperatures are highest in mid-year and lowest during the winter months of December and January.

Rainfall

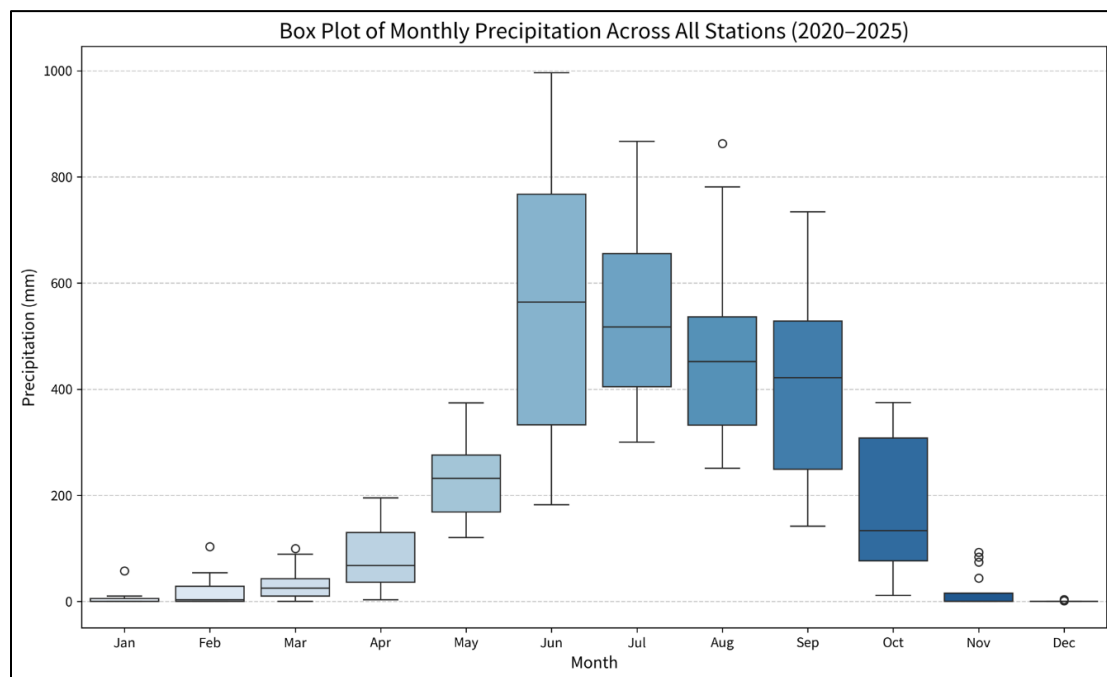


Figure 5-VII: Monthly Average Rainfall

The rainfall data across Chandra Gadhi, Sanischare, and Anarmani Birta reveals a similar seasonal pattern characteristic of a monsoon climate, with heavy rainfall concentrated between May and October. During the peak monsoon months of June and July, values frequently exceed 500 mm, reaching as high as 978.5 mm at Chandra Gadhi in 2022. Conversely, the winter period from November to February is exceptionally dry, often recording 0 mm or negligible amounts of precipitation across all three stations. This moisture cycle aligns with the temperature data, where the highest rainfall occurs during the months when average maximum temperatures consistently stay above 30°C.

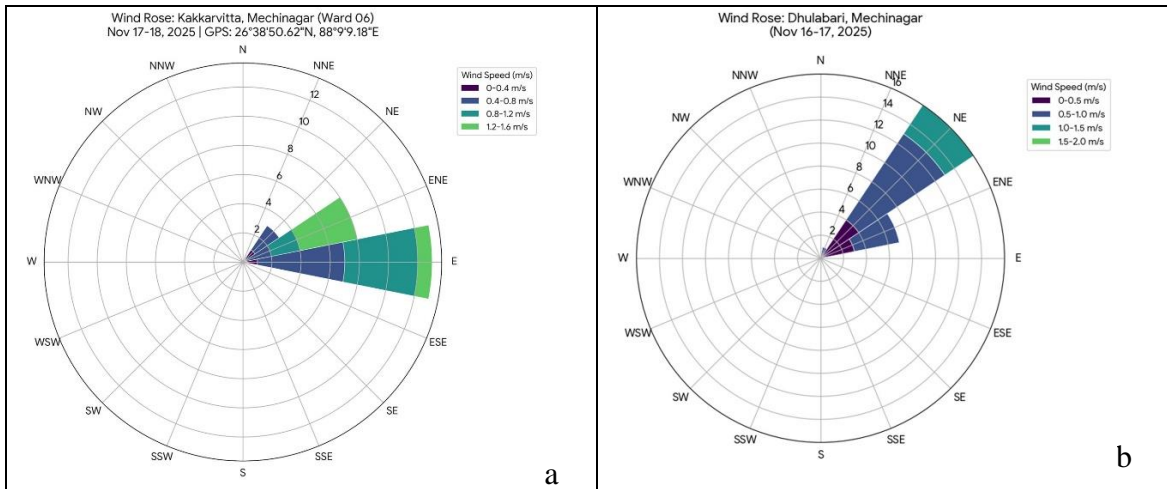
Wind speed

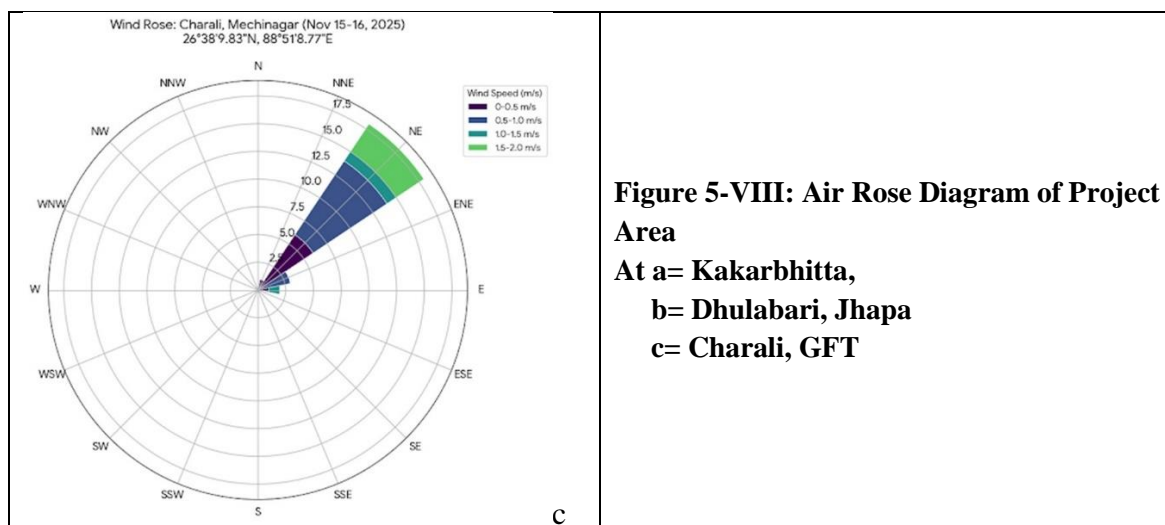
A 24 hour wind speed was measured at three different location in the project area during the field visit. The major wind characteristics is shown in table 5-III and graphically presented in Figure 5-VIII.

Table 5-III: Wind Characteristics

Parameter	Kakarvitta	Charali	Dhulabari
Primary Wind Direction	North-North-East (NNE)	North-East (NE)	East-South-East (ESE)
Secondary Wind Direction	South-East (SE)	South-East (SE)	North-East (NE)
Maximum Wind Speed	1.5–2.0 m/s	1.5–2.0 m/s	1.0–1.5 m/s
Predominant Speed Range	0.8–1.2 m/s	0.5–1.2 m/s	0.5–1.0 m/s
Calm/Low Speed (<0.5 m/s)	Low frequency	Moderate frequency	High frequency
Observation Period	Nov 15–17, 2025	Nov 15–17, 2025	Nov 15–17, 2025

Source: Field Visit, 2025





Result Highlights

Directional Trends: A consistent katabatic "Mountain-to-Plain" pattern from the North-East prevails, alongside a secondary East-South-East flow.

Wind Speed: Sites exhibit light air (< 2.0 m/s), typical for the Terai plains during the post-monsoon to winter transition.

Emission Dispersion: The dominant NNE-NE and ESE axis suggests construction dust or emissions will primarily disperse toward the Southwest and West-North-West. However, the wind characteristics change with respect to seasons.

5.1.5 Hydrology and Drainage

There are seven rivers crossings along a petroleum pipeline route within the Nepal's territory excluding the Mechi River which is trans-boundary River between Nepal and India. These rivers lie between 34.842 km and 46.892 km chainage starting from the Siliguri IOC terminal. The bank widths of the rivers vary from 24.43m (Phulwasa River) to 238.51m (Ninda River).

Table 5-IV: Rivers across the Petroleum pipeline alignment

S.N.	River/Stream	Crossing Chainage (km)	Bank Width(m)	HFL (m) MSL	Remark
1.	Mechi River	34.842	432.11	123.420	Perennial and Trans-boundary River
2.	Kali Khola	37.751	24.94	119.830	Non-Perennial, through residential area
3.	Pali Khola	38.698	45.85	121.000	Non-Perennial
4.	Ninda Khola	41.879	238.51	128.240	Perennial, fish presence noted
5.	Timai Khola	42.765	28.43	124.570	Intermittent, Fish presence noted
6.	Dhukure Khola	44.070	31.36	124.000	Non-Perennial
7.	Hadiya Khola	45.158	56.63	129.150	Perennial

S.N.	River/Stream	Crossing Chainage (km)	Bank Width(m)	HFL (m) MSL	Remark
8.	Phulwasa Khola	46.892	24.43	127.710	Low flow

Only the Mechi River which is trans-boundary and Ninda, Hadiya and Phulwasa River is perennial, while others are non-perennial, experiencing seasonal flow. Among the eight crossing rivers, Ninda is the widest (238.51m), and Phulwasa the narrowest (24.43m).

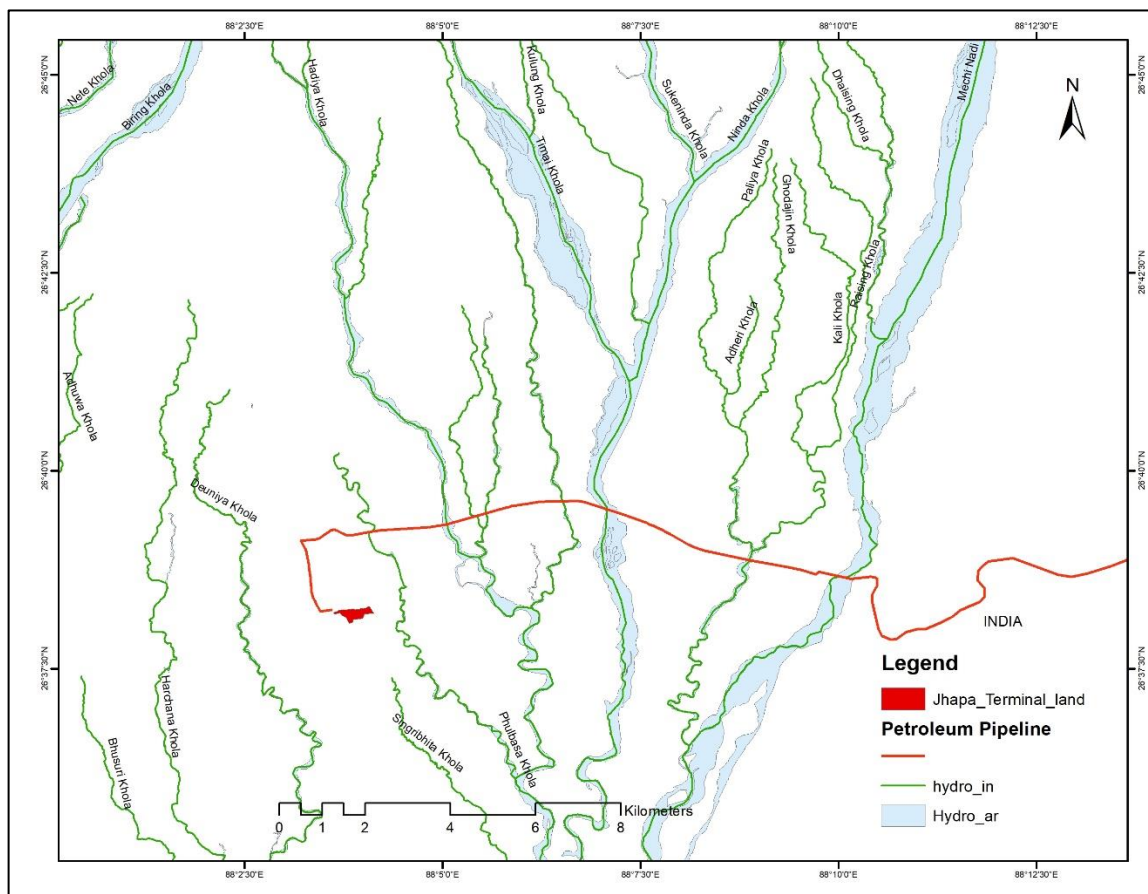


Figure 5-IX: Rivers across the pipeline alignment

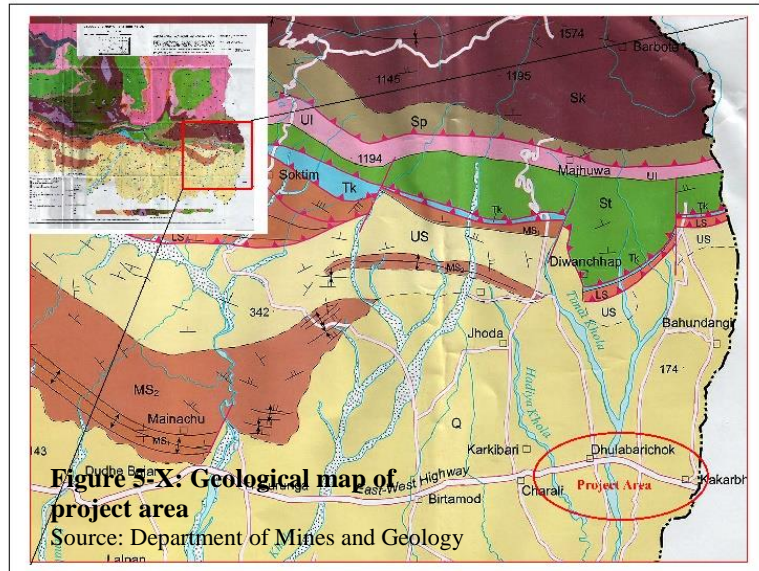
5.1.6 River Morphology and Embankment Erosion

The rivers and streams moves through the Terai plain. Despite of the low gradient, only the rivers, Mechi and Ninda show the meandering characteristics and others are somehow straight. As the highway is being upgrading, where the petroleum pipeline align, the river and streams bank was embanked by gabbing, or will be channelize for bridge foundation. The Ninda River only has the depositional characteristics. Others streams possess the clay and silt as riverbed deposition. No any mode of failure such as scouring at the bank toe, tension cracking, or mass slumping due to the gravity were seen. As the streams originating in the Chure Regions and southern part shows high discharge fluctuation especially in the monsoon seasons, can trigger the bank erosion that may cause the exposure of the pipeline. So, the riverbank protection

work is recommended if there no or length of HDD should be sufficient to prevent possible exposure due to the river bank cutting.

5.1.7 Geological Condition and Soils

Based on the geological map published by Department of Mines and Geology, Nepal, the project area is predominantly underlain by Quaternary alluvial deposits (Q) of the Terai, composed of unconsolidated sand, silt, gravel and boulder deposits associated with active fluvial systems extending across the project area. Approximately 8–15 km north of Charali, the terrain begins transitioning into the Siwalik Group formations (Lower, Middle and Upper Siwalik), comprising sandstone, mudstone, shale and conglomerate, while the Siwalik foothill belt becomes more pronounced toward



Ilam at roughly 15–30 km north/northeast of the reference area. The major Siwalik–Terai boundary (frontal geomorphic transition) lies close to the northern margin of the Charali area, whereas the regional Main Boundary Thrust (MBT) separating the Siwalik and Lesser Himalayan formations occurs farther north, approximately 30–50 km project area. Overall, the area lies within a geologically sensitive transition zone from recent alluvial plains to folded Sub-Himalayan and Lesser Himalayan formations, with these lithological and structural boundaries strongly influencing drainage, erosion, slope processes and seismic sensitivity.

5.1.8 Crossings across the pipeline alignment

The proposed petroleum pipeline traverse across the eight rives and stream including trans boundary Mechi River, 36 highway drainage, two drinking water pipeline, and once proposed E-W railway route. Additionally, 68 feeder roads including all types of road such as metal, asphalt, RCC are linked to the E-W Highway on the southern edge. The list of crossing is attached in Annex VIII.

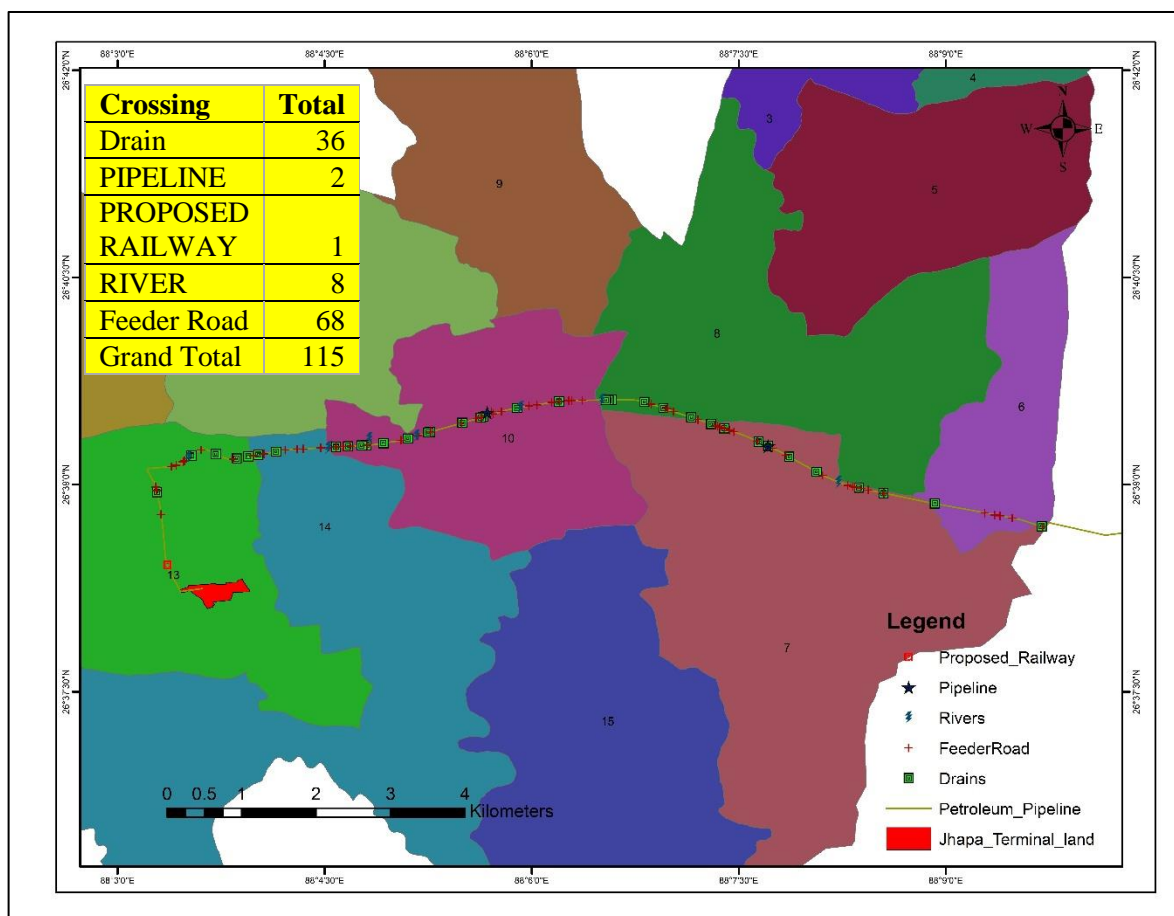


Figure 5-XI: Crossing across the petroleum pipeline alignment

5.1.9 Air Quality

Information on air quality in Nepal section of the Siliguri-Jhapa Petroleum Pipeline Area is shown in Table 5-V. The main sources of air pollution in the project area include current road upgrading activities, vehicular emission. The baseline information of the air quality status has been measured at three locations during Nov 15 to 18, 2025 using Pollusense (Model No. BO01S001) to characterize the current air quality within the study area. The three locations (**Table 3-V: Air Quality Sampling Location**) along the alignment were selected in order to represent the typical locations such as highly crowded areas and sensitive receptors (Hospital, School, etc.), settlements, forest areas and rural areas. The air quality parameters that were measured during the monitoring were: Respirable Particulate Matter with Aerodynamic Diameter of 10 Micrometer (PM₁₀, PM_{2.5}), Total Suspended Particles (TSP), and Sulphur Dioxide (SO₂), Nitrogen Dioxide (NO₂), Carbon Monoxide (CO) for ambient air quality.

Table 5-V: Air Quality Status

S.N.	Parameter	Unit	AQ1	AQ2	AQ3	NAAQS (2012)
1	Particulate Matter ≤ 10 μm (PM ₁₀)	μg/m ³	81.81	86.58	88.26	120
2	Particulate Matter ≤ 2.5 μm (PM _{2.5})	μg/m ³	34.98	36.24	37.54	40

S.N.	Parameter	Unit	AQ1	AQ2	AQ3	NAAQS (2012)
3	Total Suspended Particulates, (TSP)	$\mu\text{g}/\text{m}^3$	171.53	184.58	191.28	230
4	Sulphur Dioxide (SO ₂)	$\mu\text{g}/\text{m}^3$	1.30	1.56	1.82	80
5	Nitrogen Dioxide (NO ₂)	$\mu\text{g}/\text{m}^3$	2.18	2.42	2.76	70
6	Carbon Monoxide, (CO)	$\mu\text{g}/\text{m}^3$	480	460	485	10000

Result

All parameters measured across all three sites are within the permissible limits set by the National Ambient Air Quality Standards (NAAQS, 2012) of Nepal. The concentrations of gaseous pollutants (SO₂ and NO₂) are significantly below the safety thresholds.

5.1.10 Noise Level

Noise associated with pipeline construction will be short term in the project area but cannot be fully mitigated. Therefore residual noise impacts during construction are recognized.

The main sources of noise pollution in the project area are traffic and other commercial activities in the road alignment. The noise level in the Project area has been measured at three location. The noise levels were calculated on the day (6 am-6pm) time and night (6pm-6am) time. The highway corridor and Terminal site are considered as the mixed residential area. It is found that the recorded noise level in some locations are within the permissible limits (63 dB(A)) for day-time outdoors urban mixed residential area and higher than in the night time (55 dB(A)) for all noise level measured location prescribed by WHO. The results of noise (day time and night time) during the measurement period are shown in Table 5-VI.

Table 5-VI: Representative Noise Level of the Project area

Location	Noise Level Leq dB(A)		National Standards		Remark
	Day Time	Night Time	Day	Night	
Green Field Terminal	56.6	54.6	63	55	
Dhulabari	60.1	58.8			
Kakarbhitta	61.6	59.4			

Source: Field Visit, 2025

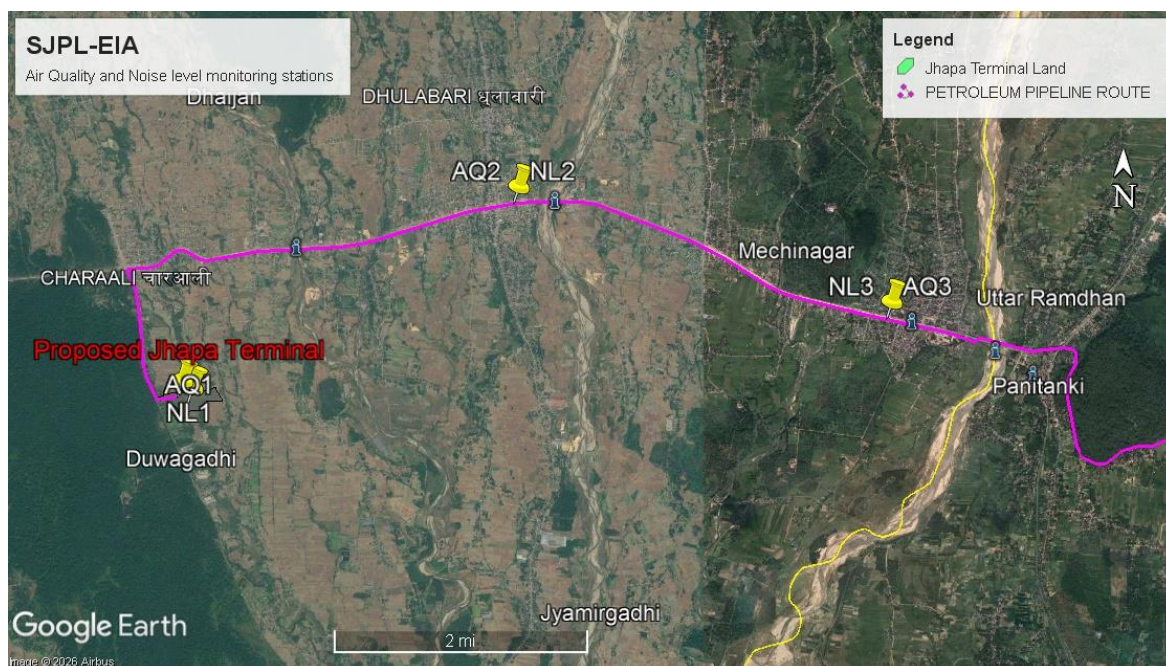


Figure 5-XII: Air and Noise Quality Measuring Stations

5.1.11 Water Quality

The project area lies in the Terai; the region which has bountiful groundwater sources to supply for drinking, domestic and other industrial purpose. The seasonal range of depth to water table in this region varies from 5-10 meter in monsoon seasons whereas 10 to 20 meter in dry season.

Water quality in the project area were tested from nine different locations. Therefore, the quality of water was compared with National Drinking Water Quality Standards (NDWQS) whereas the quality of river was compared with Generic Standard because river water has various sources of pollution such as point and non-point sources. Water quality assessment were carried out at these places to know the baseline condition of river (surface water) and tube-well so that they can be compared with the post-project condition.

Water Sampling Locations

Eleven water samples were collected from various locations, six (6) from surface water sources and three (3) from groundwater sources and additionally two control sample from rivers. These samples were collected as grab samples, preserved and analyzed for various parameters. The samples were analyzed as per the procedures specified in standard methods for the examination of water and wastewater.

Table 5-VII: Water Quality Status of Ground Water

Parameter	Unit	Itta-Bhatta	Charali Chowk	Green Field Terminal	NDWQS
Physicals					

Conductivity	µS/cm	174	340	206	1500
pH at 20°C	-	6.7	6.9	6.8	6.5–8.5
Total Dissolved Solids	mg/L	87	170	103	1000
Color	TCU	5	5	5	5
Turbidity	NTU	3.99	3.02	13.75	5
Chemicals					
Ammonia	mg/L	0.26	0.96	1.46	1.50
Chloride	mg/L	5.07	26.37	2.03	250
Iron	mg/L	0.69	0.76	0.58	0.30
Total Hardness as CaCO ₃	mg/L	56	92	66	500
Nitrate	mg/L	1.39	28.30	1.06	50
Arsenic	mg/L	<0.005	<0.005	<0.005	0.05
Microbiological					
E. coli	CFU/100ml	0	0	0	0

Source: Laboratory Analysis of sampled ground water, 2026

Lab analysis remarks:

- Iron concentration for all three samples are significantly exceed the NDWQS limit of 0.30 mg/L.
- Green field terminal sample shows a turbidity level of 13.75 NTU, which is nearly three times the permissible limit of 5 NTU.
- All samples tested is negative for E. coli (0 CFU/100ml).

Table 5-VIII: Water Quality Status of Stream/River Water

Parameters	Unit	Fulbasa Khola	Hadiya Khola	Kali Khola	Timai Khola	Palia Khola	Ninda Khola	Hadiya Khola-Control Point	Ninda Khola-Control Point	Target Water Quality Range
Physical										
Conductivity	µS/cm	175	113	227	123	222	132	110	126	-
pH at 20°C	-	6.3	6.9	6.8	6.9	7.1	6.5	6.8	6.6	6.5–9.0
Total Dissolved Solids	mg/L	87	56	113	123	111	66	55	63	<2000
Turbidity	NTU	3.73	17.93	1.51	2.75	20.9	13.01	16.28	12.46	-
Total Suspended Solids (TSS)	mg/L	112	228	146	58	194	168	218	154	<20000
Chemical										
Iron	mg/L	0.89	1.23	0.71	0.68	0.85	3.41	1.18	3.16	<10
Ammonia	mg/L	1.31	0.4	0.25	0.23	2.34	0.37	0.3	0.28	0–30
Nitrate	mg/L	0.42	0.12	4.62	0.8	6.27	0.61	0.16	0.56	<300
BOD	mg/L	45	18	12	5	14	6	15	8	<15
COD	mg/L	92	39	26	11	29	14	32	17	<40
Oil & Grease	mg/L	1.38	0.34	0.64	0.58	1.16	0.38	0.3	0.42	<300
Total Hardness as CaCO ₃	mg/L	150	128	148	136	182	142	122	149	20–100
Chloride	mg/L	9.13	6.08	21.3	6.08	9.13	3.04	5.59	3.19	-
Total Petroleum Hydrocarbon	mg/L	1.63	0.58	0.88	0.86	1.29	0.58	0.48	0.67	-
Biological										
Total Coliform	CFU/100mL	12	18	15	12	16	6	16	8	-

Source: Laboratory Analysis of sampled surface water, 2026

The water quality across the eight samples indicates a significant regional issue with Total Hardness, which consistently exceeds the target range of 20–100 mg/L at every location. Fulbasa Khola is the most environmentally stressed source, showing extreme organic pollution with a BOD of 45 mg/L and a slightly acidic pH that violates aquatic ecosystem standards. In contrast, while rivers like Ninda Khola exhibit naturally higher iron levels, most other chemical and biological parameters remain within safe limits for aquatic life.

5.1.12 Traffic Volume and Composition

The vehicular movement volume and composition is another considerable factor for the both construction and operation phase.

Table 5-IX: Traffic volume and composition

Location	Dhulabari, Mahendra Highway	Charali, Mechi Highway	Remark
N	26°39'34.43"	26°39'2.35"	
E	88° 5'58.59"	88° 3'15.17"	
Date	16 th Nov, 2025	17 th Nov, 2025	
BUS	108	6	
HIACE	104	0	
MAGIC VAN	108	12	
CAR	216	12	
AUTO RICKSHAW	120	36	
BIKE	240	90	
CYCLE	108	24	
TRUCK	86	6	
TRACTOR	12	12	
PIK UP	120	16	
Total	1222	214	

Traffic surveys conducted from November 16 and 17, 2025, show high vehicle volumes across three locations along the pipeline alignment, led by bikes and cars.

5.1.13 Drainage and Stream near to the GFT

There is mud drainage crossing the Green Field Terminal (GFT) with the length of approximately 800 meter. This natural channel is part of a Fulbasa Stream system, which is located about 50 meter to east, functioning as a primary channel for surface runoff during the heavy monsoon season. By following the natural contours of the land, this drainage system prevents waterlogging within the terminal boundaries and ensures that excess water is efficiently directed toward lower land.

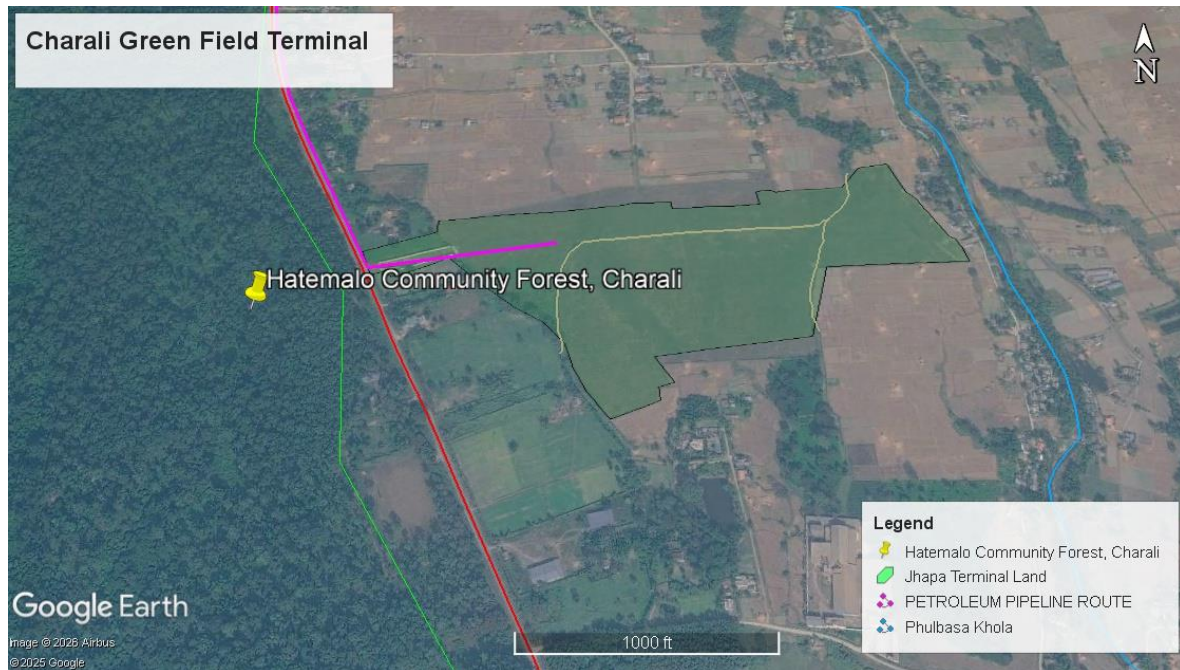


Figure 5-XIII: Jhapa Charali Green Field Terminal

As the terminal transitions from a barren land into a petroleum storage facility, preserving or formalizing this drainage path is essential for environmental stability and to avoid localized flooding.

5.1.14 Seismic Risk

Seismic hazards in Eastern significantly pose the threat to the petroleum pipeline, as the region is identified as high seismic risk area due to proximity to the fault line which is approximately 12.180 km. According to the NBC 105:2020 codes, the project area lies on zone with seismic zone coefficient (Z) 0.34 with PGA 3.34 m/s² which is categorized as high seismic zone. Earthquakes can cause ground shaking, fault rupture, liquefaction, potentially damaging pipeline infrastructure resulting operational disruption, ruptures in oil, fires, or explosions, and lead to environmental contamination. The pipeline and receiving facilities should compliance with NBC 105:2020 and IS 1893:2016 codes and standards and IOC and NOC must coordinate to harmonize standards.

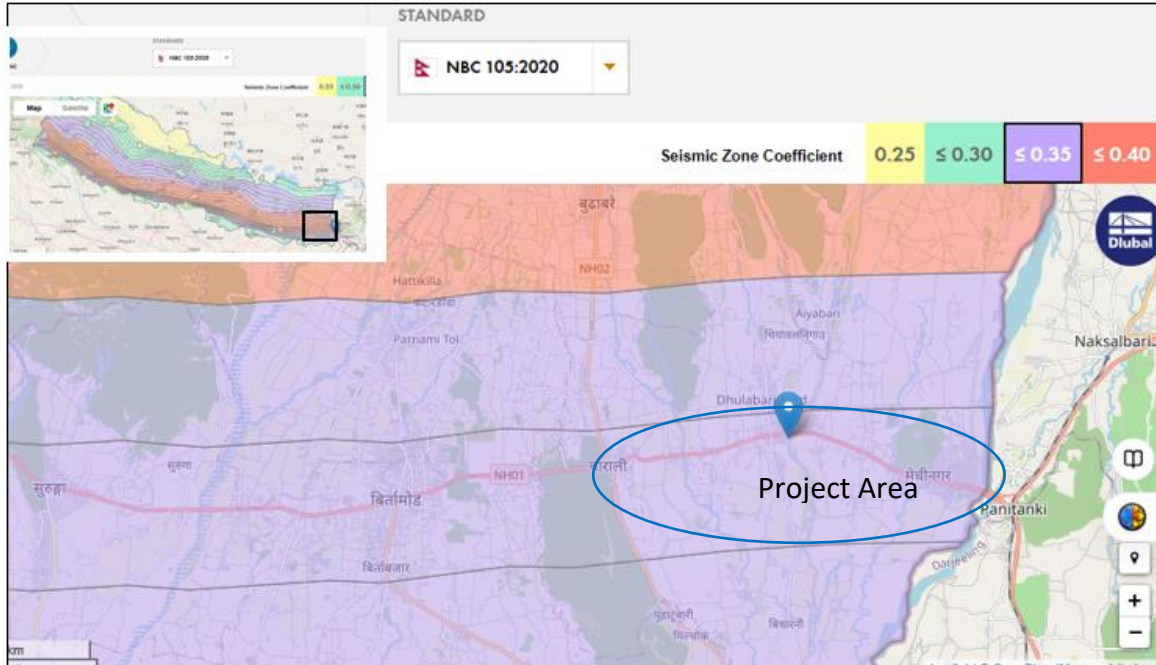


Figure 5-XIV: Seismic zoning of project area.

Source: seismic-nbc-1052020

5.1.15 Flood

Based on the fluvial flood hazard map, the pipeline route (East-West Highway) exhibits varying degrees of flood risk. The figures below suggest that the primary flood risk for the pipeline corridor is riverine flooding. The infrastructure near the bridges crossing the Ninda Khola and the Mechi River are the most vulnerable points. The map highlights that while the town center is on slightly higher ground, the eastern and western outskirts are prone to significant inundation during extreme weather events. In areas designated as high-risk, the pipeline would be more susceptible to damage from floodwaters, erosion, and debris. In areas where the pipeline cross flood-prone regions, specific engineering measures such as increasing the depth of burial, designing the pipeline to withstand buoyant forces, should be implemented to enhance its resilience.

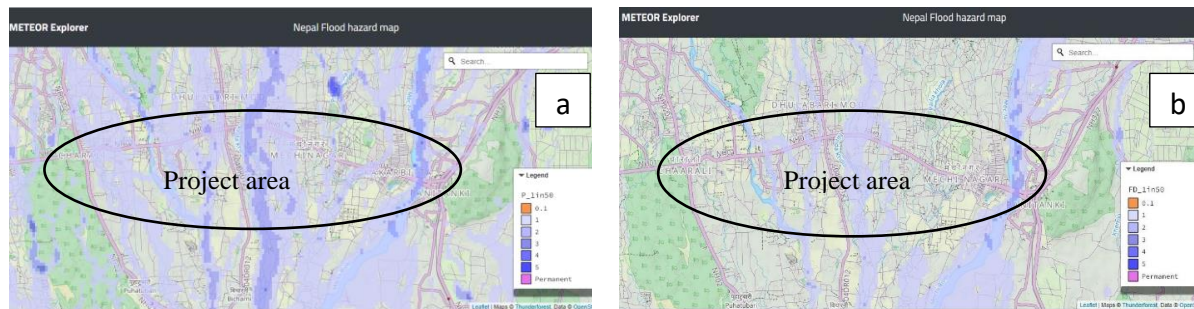


Figure 5-XV: Flood Probability map with 50- yrs return of period

a= Pluvial Flood Map, b= Fluvial Flood Map

Source: map/flood-npl, published: Mar 06, 2019

5.1.16 Waste management

During construction, approximately 100 workers will generate 25.1 kg of daily waste (at 0.251 kg/worker). Furthermore, construction activities will produce excess materials such as concrete and debris. Small quantities of hazardous waste—including lubricants, hydraulic oils, and engine filters—will also be generated, primarily from vehicle maintenance. To effectively manage waste, organic and construction debris will be segregated at the source for composting or landfill site. The vehicles will be maintained at the garage.

5.1.17 Ancillary Facilities

The ancillary facilities such as workforce camp and stockpiling site will be located within the proposed petroleum storage terminal. The basic requirements for the labor camp will be arranged and health and sanitation will be maintained.

5.1.18 Other Sensitive Places

The sensitive area within the 100 M buffer from the pipeline is surveyed and mapped during field visit. The sensitive places/area other than previously mentioned is shown in Figure 5-XV. Other such places includes hospitals, play ground, buspark. The details of the places is attached in Annex VIII.

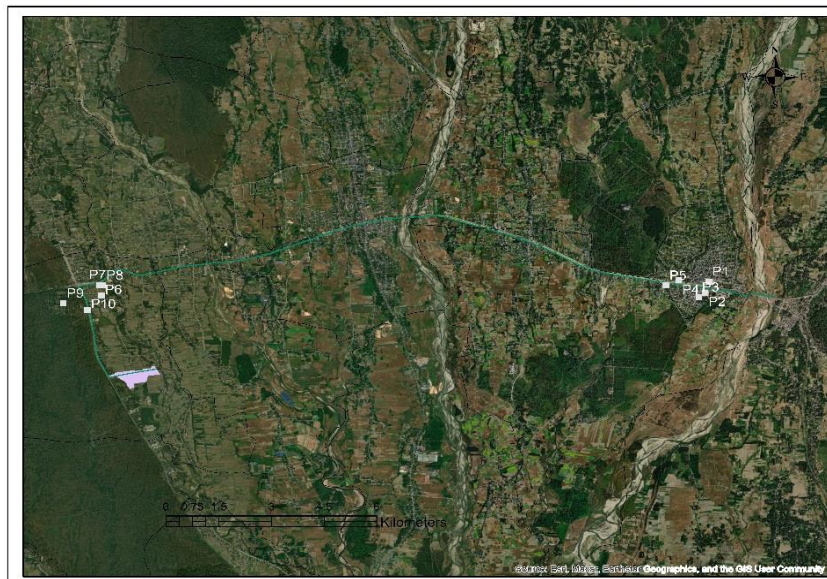


Figure 5-XVI: The sensitive places

5.2 Biological Environment

The pipeline route does not pass through any protected areas such as National Parks, Conservation areas, wildlife Reserve, Hunting Reserve, Protected Forest areas and animal sanctuaries.

5.2.1 Forest and Forest Types

The project area falls from the tropical climatic zone. It lies in a tropical monsoon climate, where summers are very hot and winters are dry and cold. The forest and vegetation in the project area belong to the tropical regional vegetation type. However, the project alignment does not pass through any forest area.

The nearby forest area is Charali Forest Block which is comprised of four community forest viz. Hatemalo community forest, Pragati community forest, Hariyali community forest and

Chandragadi community forest. The roadside forest is Hatomalo Community Forest. The pipeline alignment traverse about 1.706 KM along the Mechi Highway of the RoW 30 meter which separates the forest area and settlement area.

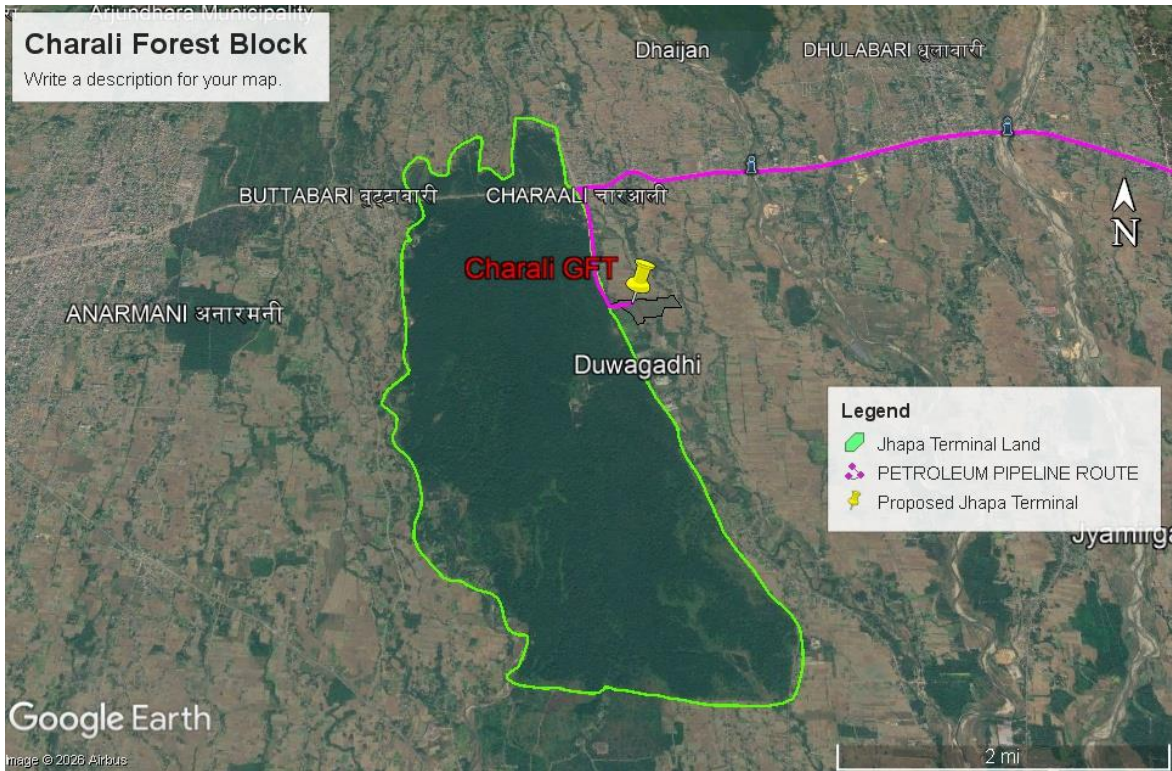


Figure 5-XVII: Charali Forest Block and proposed GFT

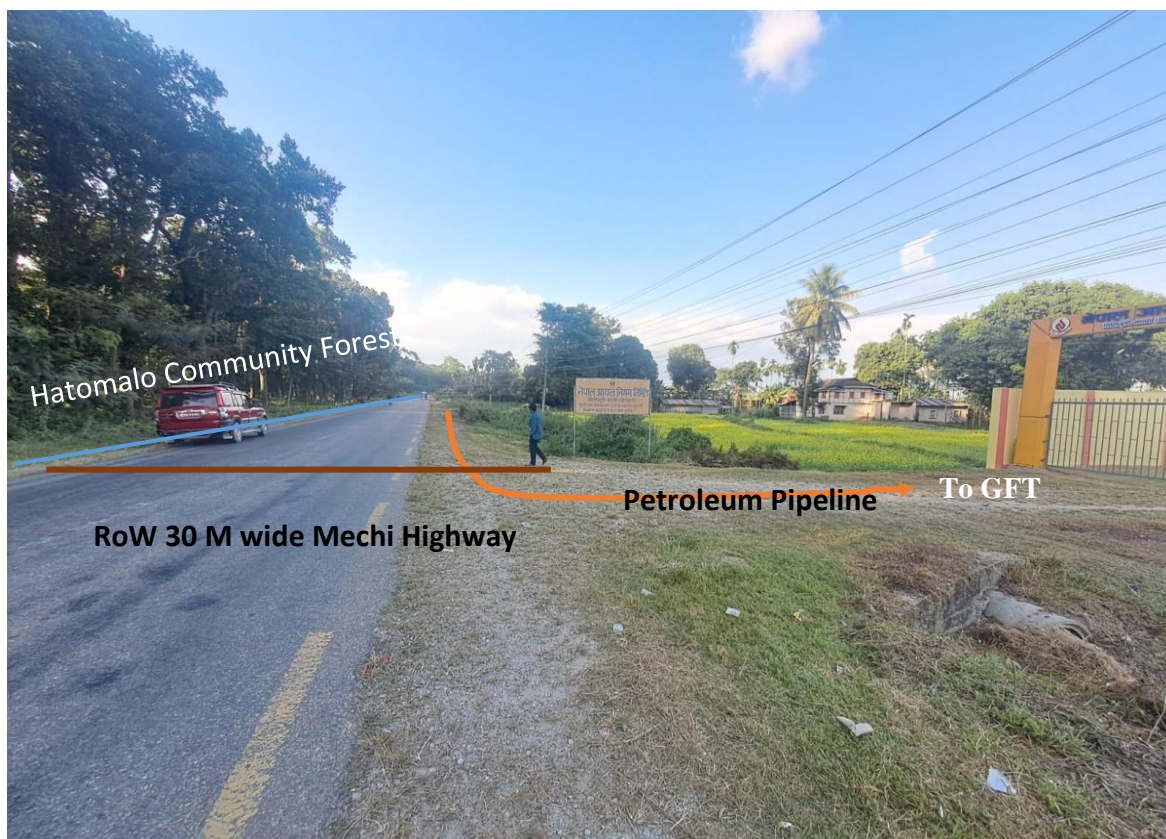


Figure 5-XVIII: Pipeline alignment along the Mechi Highway

The main forest type around indirect impact zone of the project alignment area is Sal forest along with Asna (*Terminalia alata*), Botdharanro (*Lagerstroemia parviflora*), Bhellar (*Trewia nudiflora*), and Khirro (*Sapium insigne*). Along the riverbanks and in areas prone to inundation, there are mixed forests of Simal (*Bombax ceiba*) and Bhellar (*Trewia nudiflora*) along with predominantly Sisau (*Dalbergia sissoo*). The forest areas within the project site are managed through community user groups.

5.2.2 Flora

5.2.2.1 Tree species diversity

The project area falls within the tropical region. There is found natural and planted forests. The project area is distributed with Sal (*Shorea robusta*) forest and Dalbergia sissoo forest types. Sal (*Shorea robusta*) is dominant forest species. The associated species include Saj (*Terminalia alata*), Khair (*Acacia catechu*), Simal (*Bombax ceiba*), Sindure (*Mallotus phillipensis*), Rajbrikshya (*Cassia fistula*), Badkamle (*Caesaria glomerata*), Bot Dhayero (*Lagerstroemia parviflora*), and Kusum (*Schleichera oleosa*). The shrub layer is occupied by *Murraya koenigii*, *Angeri (Melastoma normale)* and *Clausena exavata*, etc. Details of the species found during census survey are presented in Table 5-IX.

Table 5-X: Tree species found around the project area

S.N.	Local Name	Scientific Name	Distribution	Conservation Status
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			Low	Medium	High	IUCN	CITES	GoN
1.	Sal/ Sakhuwa	<i>Shorea robusta</i>			√			P
2.	Dhayanro	<i>Lagerstroemia parviflora</i>			√			
3.	Asna	<i>Terminalia alata</i>		√				
4.	Khirro	<i>Sapium insigne</i>		√				
5.	Sisau	<i>Dalbergia sissoo</i>	√					
6.	Simal	<i>Bombax ceiba</i>	√					
7.	Chilaune	<i>Schima wallichii</i>		√				
8.	Bhellar	<i>Trewia nudiflora</i>		√				
9.	Siris	<i>Albizia lebbeck</i>		√				
10.	Amala	<i>Phyllanthus emblica</i>	√					
11.	Barro	<i>Terminalia bellirica</i>	√					
12.	Bel	<i>Aegle marmelos</i>	√					
13.	Bhalayo	<i>Semecarpus anacardium</i>	√					
14.	Masala tree	<i>Eucalyptus camaldulensis</i>		√				
15.	Khayar	<i>Senecalia catechu</i>	√					
16.	Mango	<i>Mangifera indica</i>		√				
17.	Kadam	<i>Neolamarckia cadamba</i>	√					

Sources: Field Visit survey, 2025

(IUCN Category, LC- Least Concern, EN- Endangered, NT- Near Threatened, V- Vulnerable; CITES, I- Appendix I, II- Appendix II and Government of Nepal (GoN), P- Forest act – 2076,, Forest regulation 2082 (3rd amendment).

5.2.2.2 Non Timber Forest Products Species

The Table 5-X lists various Non Timber Forest Products (NTFPs) found around the project area, highlighting a rich biodiversity that includes medicinal plants alongside common grasses and ferns.

Table 5-XI: List of NTFP found around the project area

S.N	Local name of Species	Scientific Name
Herbs		
1.	Marethi (मरेठी)	<i>Acmella paniculata</i>
2.	Unyu (उन्यू)	<i>Adiantum sps Athyrium filix-femina</i>
3.	Seto Gandhe (सेतो गन्धे)	<i>Ageratum conyzoides</i>
4.	Nilo Gandhe (निलो गन्धे)	<i>Ageratum houstonianum</i>
5.	Ghiu Kumari (घिउ कुमारी) (<i>Aloe vera / Indian aloe</i>)	<i>Aloe vera</i>
6.	Jal Kumbi (जल कुम्बी)	<i>Alternatharia philoxeroides</i>
7.	Bhringi Jhar (भिरिङ्गी झार)	<i>Alternatharia sessilis</i>
8.	Lunde (लुँडे)	<i>Amaranthus sps</i>
9.	Rato Charpate (रातो चारपाते)	<i>Anisomeles indica</i>

S.N	Local name of Species	Scientific Name
10.	Titepati (तितेपाति)	<i>Artemisia indica</i>
11.	Furke Khar (फुर्के खर)	<i>Arundinella nepalensis</i>
12.	Makai Bansa (मकै बन्सो)	<i>Axonopus compressus</i>
13.	Bans (बाँस) (<i>Bamboo</i>)	<i>Bambusa sp.</i>
14.	Kalo Kuro (कालो कुरो)	<i>Bidens pilosa</i>
15.	Ajmwari (अजम्वरी)	<i>Bryophyllum pinnatum</i>
16.	Sano Tapre (सानो टाप्रे)	<i>Cassia tora</i>
17.	Ghoda Tapre (घोड टाप्रे)	<i>Centella asiatica</i>
18.	Bet (बेत)	<i>Cheilocostus speciosus</i>
19.	Batul Pate (बातुल पाते)	<i>Cissampelos pareira</i>
20.	Karkalo (कर्कलो)	<i>Colocasia esculenta</i>
21.	Haledo (हलेदो)	<i>Curcuma sp.</i>
22.	Dubo (दुबो)	<i>Cynodon dactylon</i>
23.	Githa (गिठा)	<i>Dioscorea bulbifera</i>
24.	Niyuro (निजरो)	<i>Diplazium esculentum</i>
25.	Malti Phool (मालती फुल)	<i>Mirabilis jalapa</i>
26.	Tulsi (तुल्सी) (<i>Holy basil</i>)	<i>Ocimum tenuiflorum</i>
27.	Chari Amilo (चरी अमिलो)	<i>Oxalis corniculata</i>
28.	Bansa (बन्सो)	<i>Paspalum dilatatum</i>
29.	Bhorle (भोर्ले)	<i>Phanera vahlii</i>
30.	Ukhu (उखु) (<i>Sugarcane</i>)	<i>Saccharum officinarum</i>
31.	Kans (काँस)	<i>Saccharum spontaneum</i>
32.	Narkat (नर्कट)	<i>Phragmites karka</i>
33.	Ghode Dubo (घोडे दुबो)	<i>Hemarthria compressa</i>
34.	Kush (कुश)	<i>Desmostachys bipinnata</i>
Shrubs		
1.	Asuro (असुरो)	<i>Adhatoda vasica</i>
2.	Damai Phul (दमाई फुल)	<i>Ardisia macrophylla</i>
3.	Kurilo (कुरिलो)	<i>Asparagus racemosus</i>
4.	Karkale Phul (कर्कले फुल)	<i>Caladium bicolor</i>
5.	Aankha (आँख)	<i>Caladium bicolor</i>
6.	Gaja (गाजा)	<i>Cannabis sativa</i>
7.	Ratki Rani (रातकी रानी)	<i>Cestrum nocturnum</i>
8.	Dhursul (धुर्सुल)	<i>Colebrookea oppositifolia</i>
9.	Dhature (धतुरो)	<i>Datura metel</i>
10.	Nilkantha (निलकण्ठ)	<i>Duranta erecta</i>
11.	Siundi (सिउँडी)	<i>Euphorbia royleana</i>
12.	Rakat Pushpi (राकत पुष्पी)	<i>Hibiscus rosa-sinensis</i>
13.	Fusre Ghaas (फुस्रे घाँस)	<i>Indigo fera</i>
14.	Gai Tihare (गाई तिहारे)	<i>Inula cappa</i>
15.	Rukmini (रुकमिनी)	<i>Ixora sp.</i>
16.	Chameli (चमेली)	<i>Jasminum sambac</i>
17.	Sajjivan (सज्जिवन)	<i>Jatropha curcas</i>
18.	Asare Phul (असारे फुल)	<i>Lagerstroemia indica</i>
19.	Ari Kanda (आरी काँडा)	<i>Mimosa rubicaulis</i>
20.	Mitho Nimbu (मिठो निम)	<i>Murraya koenigii</i>
21.	Seto Chulsi (सेतो चुल्सी)	<i>Osbeckia nepalensis</i>
22.	Silam (सिलम)	<i>Perilla frutescens</i>

S.N	Local name of Species	Scientific Name
23.	Rudhilo (रुधिलो)	<i>Pogostemon benghalensis</i>
24.	Bhakimlo (भकिम्लो)	<i>Rhus chinensis</i>
25.	Ainsel (ऐसेलु)	<i>Rubus spp.</i>
26.	Kantkari (कण्टकारी)	<i>Solanum aculeatissimum</i>
27.	Sisno (सिसनो)	<i>Urtica dioica</i>
28.	Khadaï (खडाई)	<i>Themeda arundinacea</i>
29.	Khaureto (खौरैटो)	<i>Pogonatherum crinatum</i>

5.2.2.3 Herbs and Shrubs species

Table 5-XII: List of medicinal plants found around the project area

S.N	Local name	Scientific name	Use
1.	Bojho	<i>Acorus calamus</i>	For sore throat, stomach disorders, respiratory ailments
2.	Kurilo	<i>Asparagus racemosus</i>	For heart problems, lump/growth issues
3.	Ghyukumari	<i>Aloe chinensis</i>	For skin diseases, burns, cuts and wounds, pain during menstruation
4.	Tulsi	<i>Ocimum tenuiflorum</i>	For cough, asthma, diarrhea, fever, eye problems, gastric issues
5.	Babari	<i>Ocimum basilicum</i>	For heart problems, lump/growth issues, cold and cough
6.	Bhringaraj	<i>Eclipta prostrata</i>	For hair growth, wounds and injuries, piles problems, jaundice, fever, stomach and respiratory disorders
7.	Titepati	<i>Artemisa carvifolia</i>	For nosebleeds, wounds, hair fall problems, increased heart rate
8.	Rittha	<i>Sapindus mukorossi</i>	For phlegm problems, respiratory problems, cholesterol issues
9.	Rudilo	<i>Pogostemon benghalensis</i>	For stomachache, headache, urinary problems, fever
10.	Ainsel	<i>Rubus spp.</i>	For Fruit purpose
11.	Amala	<i>Phyllanthus emblica</i>	For stomach, jaundice, fever treatment
12.	Harro	<i>Terminalia chebula</i>	For stomach, jaundice, fever treatment

(Sources: Field Visit survey, 2025, DFO Jhapa)

5.2.2.4 Invasive Alien Species (IAS)

Impact of Invasive alien species were observed during the field visit.

Table 5-XIII: List of Invasive species around the project area

S.N	Local Name	Scientific Name	Invasiveness
1	Banmara	<i>Ageratina adenophora</i>	Medium
2	Seto banmara	<i>Chromolaena odorata</i>	Low
3	Ghante jhar	<i>Lantana camara</i>	Low
4	Congress Jhar	<i>Parthenium hysterophorus</i>	Medium
5	Lajjawati Jhar	<i>Mimosa pudica</i>	Medium

S.N	Local Name	Scientific Name	Invasiveness
6	Besaram	<i>Ipomoea carnea ssp. fistulosa</i>	Low
7	Lahare Banmara	<i>Mikania micrantha</i>	Medium

Source: Field Survey, 2025

5.2.3 Fauna

Although, the project alignment does not pass through any forest area, Charali forest which is adjacent to the Mechi Highway on right side (on the way from Charali to Bhadrapur) as the pipeline pass through the RoW of Mechi HW about 1.7 km. The fauna that are found around indirect impact zone of the project area was assessed by direct observation and secondary studies which are listed below.

5.2.3.1 Mammals

The following table shows mammals in around the project area.

Table 5-XIV: List of mammals

S.N	Common Name	Scientific Name	Availability			Conservation Status		
			Low	Medium	High	IUCN	CITES	GoN
1	Asian Elephant	<i>Elephas maximus</i>		√		En	I	P
2	Spotted Deer	<i>Axis axis</i>	√			LC		
3	Barking Deer	<i>Muntiacus muntjak</i>	√			LC		
4	Python	<i>Python molurus</i>	√			V	II	P
5	Jungle Cat	<i>Felis chaus</i>	√			LC	II	
6	Wild boar	<i>Sus scrofa</i>	√			LC		
	Jackal	<i>Canis aureus</i>	√			LC		

Sources: Field Visit survey, 2025, DFO Jhapa

(IUCN Category, LC- Least Concern, EN- Endangered, NT- Near Threatened, V- Vulnerable; CITES, I- Appendix I, II- Appendix II

5.2.3.2 Aves

The following table shows major species of birds in around the project area.

Table 5-XV: Aves found around the project area

S.N	Common Name	Scientific Name	Availability			Conservation Category		
			Low	Medium	High	IUCN	CITES	GoN
1	Crow	<i>Corvus splendens</i>		√				
2	Black drongo	<i>Dicrurus macrocercus</i>	√					
3	Asian Koel	<i>Eudynamis scolopaceus</i>	√			LC		
4	Red vented bulbul	<i>Pycnonotus cafer</i>	√			LC		
5	Yellow vented bulbul	<i>Pycnonotus leucogenys</i>	√			LC		
6	Parakeet	<i>Psittacula eupatria</i>	√					
7	Black Kite	<i>Milvus migreans</i>	√					

Sources: Field Visit survey, 2025, DFO Jhapa

(IUCN Category, LC- Least Concern, EN- Endangered, NT- Near Threatened, V- Vulnerable; CITES, I- Appendix I, II- Appendix II

5.2.3.3 Reptile and Amphibians

The following table shows reptile and amphibians in around the project area.

Table 5-XVI: List of reptiles and amphibians

S.N	Common Name	Scientific Name	Availability			Conservation Category		
			Low	Medium	High	IUCN	CITES	GoN
1	Pit Viper	<i>Trimeresurus lbolabris</i>	√					
2	Common rat snake	<i>Ptyas mucosa</i>	√					
3	Asian Common toad	<i>Duttaphrymus melanosticus</i>	√					
4	King Cobra	<i>Ophiophagus hannah</i>	√			V		
5	Oriental garden lizard	<i>Calotes versicolor</i>	√			LC		

Sources: Field Visit survey, 2025, DFO Jhapa

(IUCN Category, LC- Least Concern, EN- Endangered, NT- Near Threatened, V- Vulnerable; CITES, I- Appendix I, II- Appendix II and Government of Nepal (GoN), P- National Parks and Wildlife Conservation act- 2029.)

5.2.3.4 Fishes

The following table shows reptile and amphibians in around the rivers of project area.

Table 5-XVII: List of fishes found in rivers.

S.N	Local Name	Scientific Name	Availability			Conservation Category		
			Low	Medium	High	IUCN	CITES	GoN
1.	Pothiya	<i>Puntius sophore</i>	√			LC		
2.	Sidhre	<i>Puntius chola</i>	√					
3.	Hile	<i>Channa punctata</i>	√					
4.	Dedhawa	<i>Esomus danrica</i>	√			LC		
5.		<i>Lepidocephalus guntea</i>	√					
6.	Hile	<i>Channa barca</i>		√				
7.	Faketa	<i>Barilius barila</i>	√			LC		

(IUCN Category, LC- Least Concern, EN- Endangered, NT- Near Threatened, V- Vulnerable; CITES, I- Appendix I, II- Appendix II and Government of Nepal (GoN), P- National Parks and Wildlife Conservation act- 2029.)

5.2.4 Wildlife Corridor and Human Wildlife Conflict

Despite being isolated, the Charaali forest supports resident of Asian elephants for months and serves as a vital transitional corridor for migratory herds traveling from India to Jalthal.

The forest is bisected by the East-West Highway (EWH), though it remains connected to the Dhajjan and Jalthal forests via a north-south biological corridor. The upper part of the forest is connected to Bahundangi / foothills (Bhavar area) and Churia range, through small and large blocks of forests. Jalthal forest is located at 8.41 km south from Charali forest. The north-south wildlife movement corridor is, as stated by the locals is India \approx Bahundangi (Churia foot hills) \approx Daijan \approx Charali \approx Jalthal. As per local forest authorities, sometime the elephants travel to Charali directly from Panitanki, India, in small groups of 7 to 9 and visit Jalthal from there and back the same route. The new route thus would be Pani Tanki, India \approx Charali Forest \approx Jalthal. These groups generally travels in night and seen in the morning in Charali area.



Figure 5-XIX: Fencing for wildlife along the Forest Edge of the Mechi Highway

As per the forest authorities and CFUGs, an elephant herd remain in the Charali Forest block for months and they frequently appear near to the settlement rising the human-wildlife tension. So, to reduce such tension, electric fence about 6 KM is installed along the forest edge to the Mechi HW.

Human-wildlife conflict in this area is driven by habitat fragmentation, shrinking forest corridors, and increasing human settlement near forests and riverine areas. Protecting and restoring wildlife corridors, along with building wildlife-friendly infrastructure like underpasses, can help reduce conflict and allow safer movement for animals across the landscape.

5.2.5 Protected Species found around the project area

Flora

Sal forest is found on the right side of the pipeline from CH-48250 to CH-50000 and no any tree will be affected by the project. Sal (*Shorea robusta*) and Satisal (*Dalbergia latifolia*) are protected species banned for felling, transportation and export as per GoN. Sal (*Shorea robusta*) is least concern (LC) and Satisal (*Dalbergia latifolia*) is vulnerable (VU) as per IUCN.

Fauna

The Asian elephants were found as protected animal.

5.3 Socio-economic and Cultural Environment

Since the project uses the highway RoW for the pipeline trenching which is owned by the GoN, the project does not require additional private land and hence no any private property will be damaged and/ reallocated. To understand the pipeline adjacent settlement demography, 189 household were questioned on random along the route.

5.3.1 Nearby Settlements

Table 5-XVIII: Nearby settlements along the pipeline

District	Municipality	Ward	Settlement	Chainage (m)	Length (km)
Jhapa	Mechinagar Municipality	6	Mechi Old Bridge, Gairi Gaun, Bhansar, Kakarvitta	36850 to 38396	1.546
		7	Purano Bhansar, Pyarivitta, Tokala Tea Garden, Aayabari, Ittabhatta	38396 to 41425	3.029
		8	Manav Dharma Sewa Aashram	41425 to 42640	1.215
		10	Dhulabari	42640 to 45955	3.315
		14	Dhaijan,	45955 to 46875	0.92
		13	Telibari, Charali, Duhagadhi	46875 to 50213	3.338
		Within terminal			
Total					13.913

5.3.2 Population of Project Affected Municipality

According to the 2021 Census, Mechinagar Municipality has a total population of 133,073 people, with a population density of 960 individuals per square kilometer. The sex ratio stands at 9.66 males per 100 females. The municipality has a total of 32,695 households. Ward-wise population of municipality is shown in table below.

Table 5-XIX: Population Distribution in Mechinagar Municipality

Wards	Male	Female	Total
1	3120	3221	6341
2	3294	3510	6804
3	3480	3747	7227
4	2619	2820	5439
5	2496	2830	5326
6*	7478	8260	15738

Wards	Male	Female	Total
7*	6425	6763	13188
8*	3923	4373	8296
9	5707	6282	11989
10*	7612	7888	15500
11	3104	3446	6550
12*	3799	4340	8139
13*	3561	3843	7404
14	3357	3547	6904
15	4026	4202	8228
Total	64001	69072	133073

*pipeline laying wards

Source: National Population and Housing Census 2021

5.3.3 Types of House

The housing infrastructure in the project area is predominantly permanent, with the 2021 Census showing over 80% of the 16,408 households constructed from cement-bonded bricks or stone. This trend was further validated by the 2025 field visit, where 146 out of 189 sampled houses utilized cement-bonded materials, alongside smaller numbers of mud-bonded and wooden structures.

Table 5-XX: Types of house

Data Source	National Population and Housing Census 2021	Field Visit,2025
Mud bonded bricks/ stone	326	18
Cement bonded bricks/ stone	13102	146
Wood / planks	210	19
Bamboo	2335	-
Unbaked bricks	35	-
Galvanized sheet	342	-
Pre fabricated sheet	2	5
Other	56	-

5.3.4 Literacy

Mechinagar Municipality's literacy rate of 83.3% exhibits a gender disparity (88.5% male, 78.4% female), surpassing Nepal's national average of 76.2% (82.4% male, 70.1% female). (Source: National Population and Housing Census 2021)

Table 5-XXI: Educational status of the sampled population

Educationa Level	Count	Percentage
Illiterate	60	6.75%
Secondary Level	615	69.18%

Campus	219	24.63%
Total	889	100%

Source: Field visit, 2025

The 2025 field survey of 189 household within the project direct impact area reveals 93% of the population having attained at least a secondary level of education or higher. Specifically, 615 individuals have completed secondary schooling, while 219 have progressed to campus-level studies. In contrast, only 60 individuals i.e. about 7% were recorded as illiterate.

5.3.5 Cast

The data presents the population distribution among ethnic and caste groups in Jhapa District's Mechinagara Municipality, with Brahman-Hill (28,625) and Kshetri (26,037) being the most populous. The mid-range groups include Rajbansi (11,217), Yakthung/Limbu (7,685), Rai (6,848), Tamang (6,025), and Newar (5,516). Smaller population groups consist of Bishwokarma (4,994), Magar (4,190), and Pariyar (2,745).

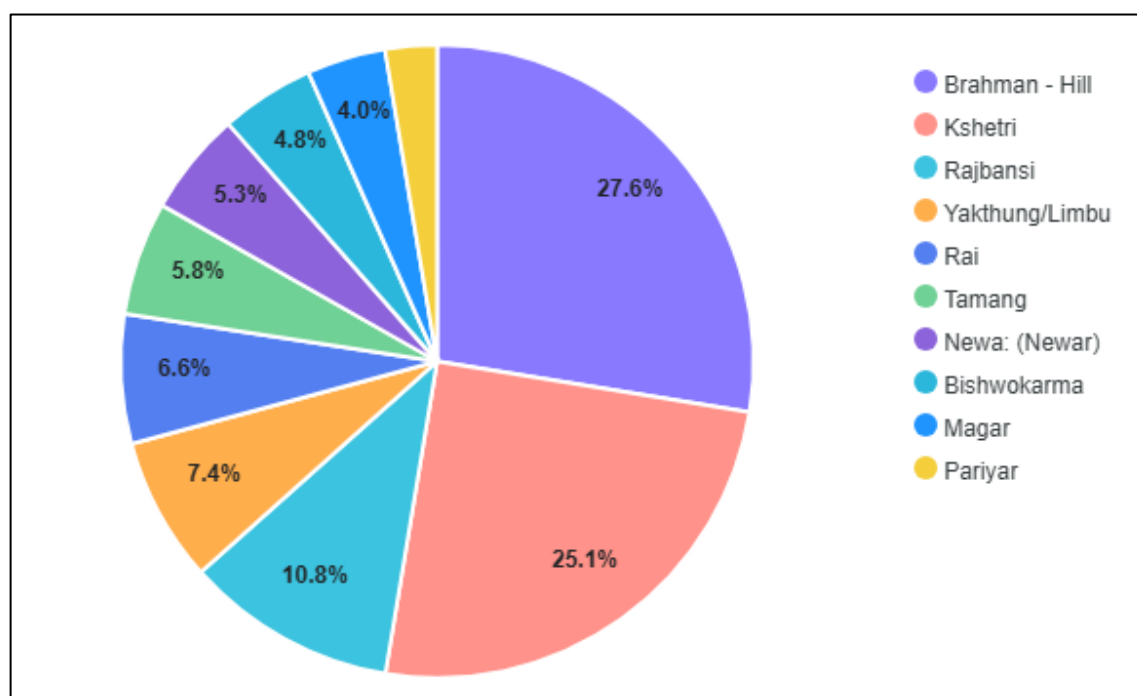


Figure 5-XX: Population by cast in Mechinagar Municipality

Source: National Population and Housing Census 2021

5.3.6 Status of Urbanization

The demographic data across the affected six wards of Mechinagar Municipality shows a total population of 67,030, with a slightly higher female distribution. The population is split between urban and peri-urban areas, with Wards 6 and 10 being entirely urban while Wards 7, 8, 13, and 14 are classified as 100% peri-urban. Notably, there is no rural population reported within these specific wards.

Table 5-XXII: Population distribution as per the urbanization

Ward	Population			Population			Population %		
	Total	Male	Female	Urban	Peri-urban	Rural	Urban	Peri-urban	Rural
6	15738	7478	8260	15738	0	0	100	0	0
7	13188	6425	6763	0	13188	0	0	100	0
8	8296	3923	4373	0	8296	0	0	100	0
10	15500	7612	7888	15500	0	0	100	0	0
13	7404	3561	3843	0	7404	0	0	100	0
14	6904	3357	3547	0	6904	0	0	100	0
Total	67030	32356	34674	31238	35792	0	200	400	0

Source: National Population and Housing Census 2021

5.3.7 Occupation

The 2025 field survey of 189 households shows that business is the primary source of income, accounting for nearly 59% of the total sample. Other significant livelihoods include salary or pensions and foreign employment, which support 33 and 30 households respectively.

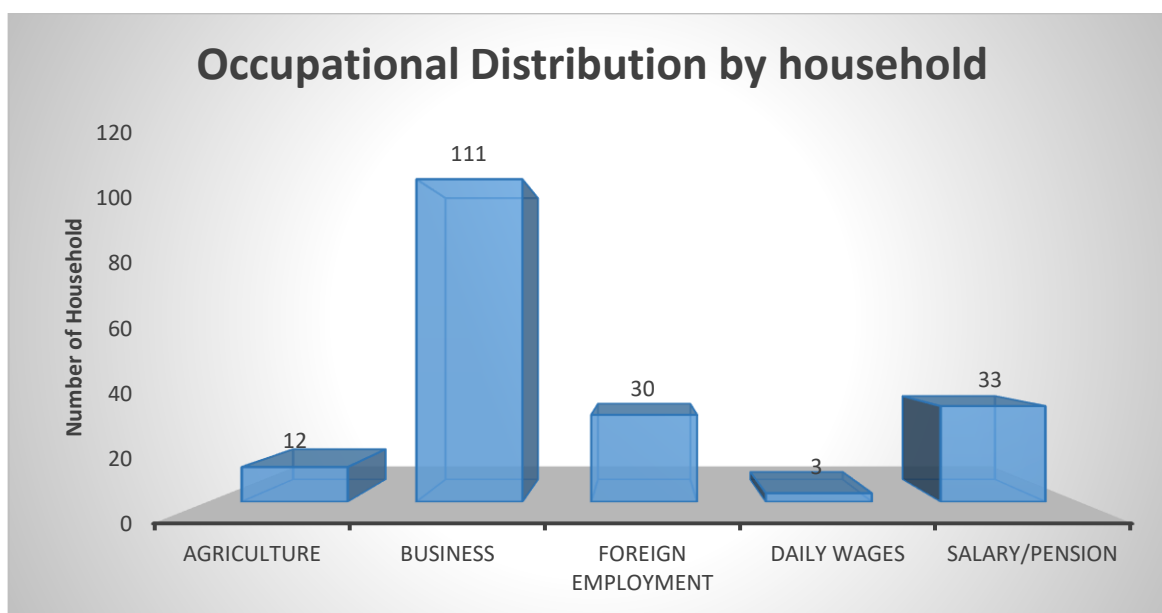


Figure 5-XXI: Occupational distribution of surveyed households

5.3.8 Drinking Water Sources

According to the 2021 Census, the project area encompasses 16,408 households, primarily relying on piped water and tube wells. However, 2025 field visits focused on a specific sample of 189 households, where the majority access piped water within their premises.

Table 5-XXIII: Drinking water source

Total Household	National Population and Housing Census 2021	Field Visit, 2025
Tap/piped water (within premises)	9067	120
Tap/piped water (outside premises)	1034	60
Tubewell / handpump	5725	9
Covered well/kuwa	123	

Uncovered well/kuwa	215	
Spout water	157	
River /stream	8	
Jar / bottle	15	
Others	64	
Total	16408	189

Source: National Population and Housing Census 2021, Field Visit, 2025

5.3.9 Income and Saving

The income and expenditure data for 189 households shows a stable economic profile, with 30.2% earning between 25,001 and 50,000 NRs. While this bracket also represents the highest spending (44.4%), nearly 84% of households keep monthly expenses below 50,000 NRs.

A significant savings capacity exists, as 27% of households earn over 75,000 NRs, yet only 3.2% spend at that level. This financial surplus indicates strong economic resilience and disposable income within the project-affected community.

Table 5-XXIV: Average income and expenditure of the sampled household

Financial Class (NRs)	Income (HH)	Income (%)	Expenditure (HH)	Expenditure (%)
Up to 25,000	45	23.80%	75	39.70%
25,001 – 50,000	57	30.20%	84	44.40%
50,001 – 75,000	36	19.00%	24	12.70%
75,001 – 100,000	27	14.30%	6	3.20%
Above 100,000	24	12.70%	0	0.00%
Total	189	100.00%	189	100.00%

Source: Field Visit, 2025

5.3.10 Health and Sanitation

The 2021 Census data for the project area shows that nearly 61% of the 16,408 households utilize flush toilets connected to septic tanks, while a significant portion still relies on pit toilets. During the 2025 field visit, a sample of 189 households mirrored this trend, with 92% having access to flush toilets (either via sewerage or septic tanks). These findings indicate a high level of sanitation coverage within the immediate project-affected area compared to broader affected ward statistics.

Table 5-XXV: Types of toilet

Type of toilet used	National Population and Housing Census 2021	Field Visit, 2025
Flush toilet (public sewerage)	234	60
Flush toilet (septic tank)	9994	114
Pit toilet	5852	15
Public toilet	62	
Without toilet facility	266	
Total	16408	189

Source: National Population and Housing Census 2021, Field Visit, 2025

As per the survey conducted, none of the responded that the project area has suffered by the epidemic and caused the death for last one year.

The project area is accessible of health services for households like pharmacies, hospitals, and clinics. Most essential medical services are located within a 0.2 km to 1.5 km radius, indicating high local accessibility to basic healthcare. While specific locations like Charali, Kakarbhitta, and Dhaijan are frequently cited for the basic health care service.

5.3.11 Historical and Cultural Sites

The project area does not possess from cultural heritage sites. However, the project alignment have some cultural and religious sites. People in the project area have different cultural values amongst the different ethnic groups.

A detail religious sites (Temples) along the pipeline alignment is given in table below.

Table 5-XXVI: List of cultural sites near to the pipeline

Chainage	Name of Structure	Ward	Settlement	Side	Remark
37550	Temple	6	Yekta Tole	Left	All these sites were outside the RoW of Highways
38650	Radha Krishna Temple	6	Punaro Bhansar	Right	
39550	Nawa Durga Temple	7	Punaro Bhansar	Left	
39565	Ganesh Temple	7	Punaro Bhansar	Right	
42450	Manaw Dharma Sewa Aashram	8	Jorsimal	Left	
42850	Durga Temple	10	Dhulabari	Left	
43250	Durga Temple	10	Dhaijan	Right	
44100	Shiva Temple	10	Dhaijan	Left	
48250	Kali Temple	13	Charali	Right	

The access way to the some temples such as Radha Krishna Temple, Durga Temple, Shiva Temple, Manab Sewa Aashram may temporarily blocked during the pipeline trench excavation.



Figure 5-XXII: Temples near to the pipeline route

5.3.12 Festivals and Other Rituals

The project area is a vibrant mosaic of Hindu, Buddhist, Kirat, Islam, and Christian faiths, represented by a diverse tapestry of Khas Arya, Rai, Limbu, Tharu, Santhal, and indigenous Rajbanshi or Dhimal communities. While Dashain and Tihar serve as universal highlights, the cultural calendar is defined by specific ethnic milestones: the Rai celebrate Udhauli and Ubhauli, Tharus mark Maghi, and Gurung/Tamang communities observe their respective Lhosars.

Table 5-XXVII: Ethnic groups and their festivals and traditions

Religious/Ethnic Group	Primary Festivals & Traditions
Hindu (Khas Arya, Terai)	Dashain, Tihar, Jitiya (Tharu), Chhath
Kirat (Rai, Limbu)	Udhauli, Ubhauli, Chasok Tangnam
Buddhist (Tamang, Gurung, Newar)	Buddha Purnima, Sonam/Tamu Lhosar
Islam	Eid-ul-Fitr, Eid-ul-Adha
Christian	Christmas, Easter
Indigenous (Santhal, Dhimal)	Sohrai, Sirijat, local ritual cycles

CHAPTER 6: ALTERNATIVE ANALYSIS

The environmental assessment for Petroleum Pipeline Project necessitates a thorough analysis of feasible alternatives to ensure the selection of the most environmentally sound, socially responsible, and economically viable option. This chapter outlines the alternatives that are considered and evaluated during EIA study.

6.1 Project no Implementation

The proposed ‘Siliguri-Jhapa Petroleum Pipeline Project’ is the second of its kind proposed in Nepal after Raxaul-Amlekhgunj pipeline project. Petroleum products-on a no project scenario—continue being transported using oil tankers. In a business as usual scenario, transportation of petroleum product only using tankers will increase the transportation cost heavily and result in increased traffic congestion along the highway resulting in increased vehicular emission, dust particles, increased accidents and result in increased investments in maintaining the road condition. Such practice leads to inefficiencies such as time delay and consumption of petroleum product for the transportation of petroleum products itself. The proposed pipeline is expected to ensure regular fuel supplies to Nepal which occasionally get disrupted by road blocks and strikes. The pipeline is expected to reduce total transportation costs, control leakage and ensure hassle-free transfer and quality of petroleum products.

The proposed pipeline is expected to ease transportation of fuel and eliminate the country’s dependence on oil tankers to import fuels from India. Besides reducing the costs, the pipeline will ensure the quality and quantity of petroleum products received at Jhapa Charali Green field terminal.

The proposed petroleum pipeline between India and Nepal will ensure continuous and uninterrupted supply of petroleum products to Nepal, fulfilling most of its petroleum energy requirements. It is also expected to generate additional revenue for the government, reduce technical loss, and avoid road deterioration, besides ensuring the quality and quantity of petroleum supplies. The pipeline project is also expected to reduce the long queues of tankers carrying petroleum products at trade and transit entry point. So, the project no implementation option is rejected.

6.2 Other Possible Alternatives

6.2.1 Alignment Alternatives

Oil pipelines constitute an essential part of infrastructure investment in petroleum projects. It is essential; therefore, pipeline route selection must be cost-effective because an optimal route influences the lifespan of the pipeline, from design and planning to construction and operation.

Two possible alignment alternatives were studied during feasibility study of project as shown in figure 6.1. Two possible alternatives are:

1. Alternative 1- Alignment outside and south to the Highway RoW, and

2. Alternative 2- Alignment within the Highway RoW

Alternative 1: The alignment starts from the Mechi Bridge, Kakarbhitta, and passes straight to the green field terminal acquiring the shortest distance. This alignment passes through the tea garden, villages and agricultural land. This alignment crosses five streams.

Alternative 2: This alignment starts from Mechi Bridge, Kakarvitta, to Charali, Jhapa and traverse within the ROW of Mahendra Highway Highway along southern edge of the RoW for 11.7 KM and along the edge of Mechi highway from Charali to green field terminal for 1.707 KM.

Table 6-I: Comparison of two different alignment alternatives

S.N.	Aspects	Alternative 1	Alternative 2	Remarks
1.	Approximate Length	Slightly Less than Alternative 2	14 KM	
2.	Land ownership	Private	Owned by Department of Road (DoR)	
3.	Land acquisition	Land and house should be acquired by NOC	Need approval from DoR	
4.	RoW clearance	There is need to make ROW clear	The RoW has been cleared.	
5.	Resettlement	May be required	Not required	
6.	Terrain	Plain	Plain	
7.	River/stream Crossing	Less than 8	8	
8.	River bank stability	Need additional work on river bank stability to prevent pipeline expose.	There is existing structures for river bank stability.	
9.	Land use consideration	Loss of agricultural land and crops	Will be used the existing road	
10.	Risk of flood and inundation	High probability	Les propability	
11.	Completion of time	Need additional time	Project will be completed in 2 year	

Hence, considering above aspects, Alternative 2 which passes within the RoW of Mahhendra highway from Kakarbhitta to Charali, Jhapa and Mechi highway from Charali to proposed GFT was selected.

In mere depth, the alternative of the possible alignment of petroleum pipeline within the highways's RoW is analysed as Alternative 2A and Alternative 2B.

Table 6-II: Alternative analysis within the RoW of Highway

Aspect	Alternative 2A: Northern and Strip	Alternative 2B: Southern Strip	Remark
Highway Crossing	Requires East-West Highway to cross	No highway cross is required	
River Scouring Risk	High: Located on the upstream side. Higher water energy can wash away soil covering the pipe.	Low: Located downstream. Water spreads out and velocity drops, providing a safer burial environment.	Risk is higher in northern strip
Bridge Safety	Proximity to highway bridge foundations on the upstream side can cause "turbulence eddies" that risk pipe exposure.	Placing the pipe downstream of highway bridges ensures it doesn't interfere with bridge structural integrity.	Southern site is more safer than northern
Approximity to the Forest	About 1.7 KM pipeline alignment falls on the edge of the Charali Forest.	If the pipeline is aligned to the east of the highway between Charali and the storage terminal, the separation distance from the forest boundary will exceed 25 meters.	

In analysis of alternatives within the RoW, the southern strip is recommended. This choice is predicated on hydraulic stability; the Southern side represents the downstream flow, which minimizes the risk of pipeline exposure due to riverbed scouring—a high-frequency risk during the flash-flood.

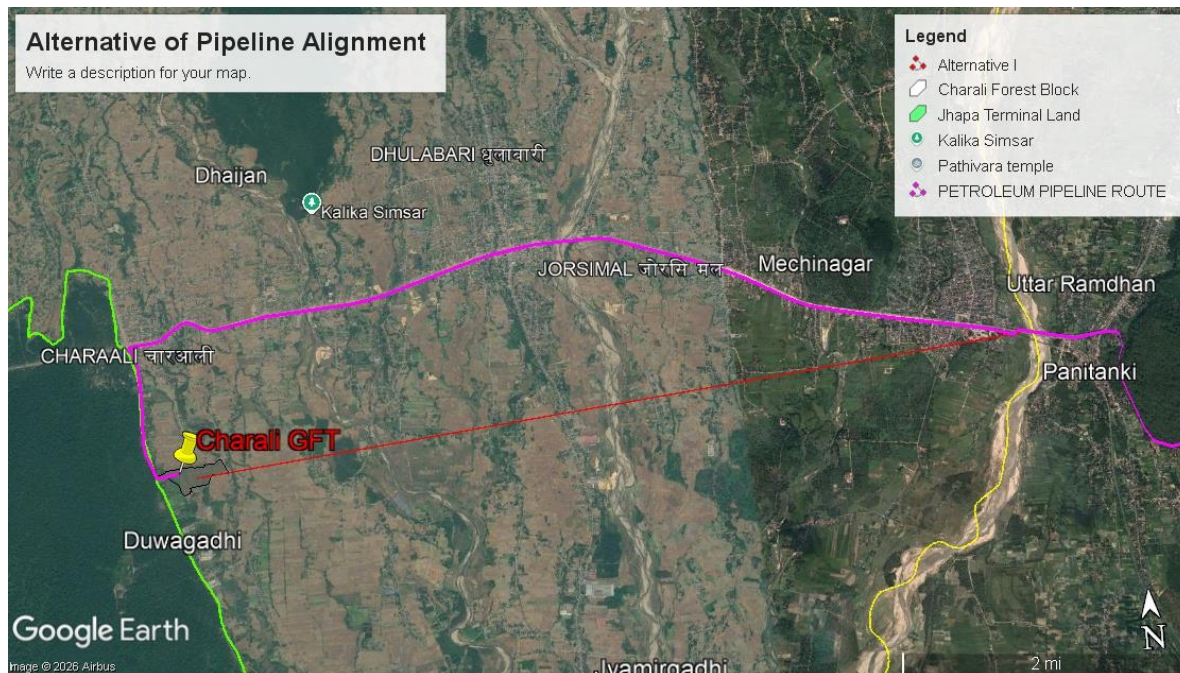


Figure 6-I: Pipeline alignment alternatives

6.2.2 Pipeline Design and Technology

The alternative analysis of the project design and technology consist of technical compactibility, safety protocol, material sourcing, operational coherence, environmental compliance etc.

The proponent has considered the alternatives for technology, implementation procedure, and raw materials requirements in close coordination with design team. In general, choices have been considered in the context of technical feasibility, cost effectiveness, possibility on the use of mechanical devices, sand with low risks of environmental hazards. All the risks resulting from the implementation of the proposal are accepted by the proponent.

CHAPTER 7: ENVIRONMENTAL IMPACTS OF PROJECT

7.1 Beneficial Impacts

By creating local jobs and boosting the economy, project activities will drive community development. Most importantly, the project ensures a reliable petroleum supply while cutting costs, reducing CO₂ emissions, and decreasing traffic accidents. Furthermore, it safeguards product integrity by preventing theft and adulteration.

7.1.1 Construction Phase

During the construction stage of the proposed Petroleum pipeline alignment and Green Field Terminal (GFT), the following beneficial impacts are likely to occur.

a. Employment opportunities

One of the beneficial impacts of the pipeline project during the construction phase is the creation of employment opportunity. While most specific technical human resources will be brought by the contractor from India as there is not adequately trained human resources in the country, the construction workers will most likely be local. The construction phase is expected to generate a massive amount of work, totaling roughly 54,750 person-days for unskilled laborers, 32,850 person-days semi-skilled workers and 21,900 person-days for skilled workers. On a daily basis, this translates to a need for about 100 workers. During recruitment of human resource, particularly for the unskilled human resource, opportunities should be given to local people-affected families, people. Employment opportunity should be given in the gender-balanced manner to the extent possible. *The impact is thus direct, of high in magnitude, local but short term in nature.*

b. Increase in Income of Local People

Besides the opportunity of labour work, the project activities open opportunities for additional business such as the establishment of tea stalls and small eateries and shops. Local resident can take advantage of these opportunities and expand their business. The consumption of local products such as vegetables, dairy products and meat products will be significantly increase which directly create the opportunities for new income generation activities. As a result, a significant amount of cash from the project works will be channeled into the local economy and will generally foster the development of other micro-enterprises. *This impact will be direct, high in magnitude, local but short term in nature.*

7.1.2 Operation Phase

a. Efficient transport of petroleum products

The transportation of petroleum products from India to Nepal is still heavily relying on tankers although Motihari-Amlekhgunj project is functioning, which have created a bottleneck, leading to severe traffic congestion that disrupts local infrastructure, high labor costs, and fuel consumption of the tankers themselves are all baked into the final price consumers pay at the

pump. It is an inefficient cycle where the method of delivery actively drives up the cost of the product.

Transitioning this supply chain to a pipeline offers a much-needed solution to these systemic vulnerabilities. By moving fuel underground, the process becomes shielded from the human errors and external risks associated with road transport, such as fuel theft, adulteration, and technical losses like evaporation or leakage. This ensures that the quality of the fuel remains pristine from the point of origin to the destination. Ultimately, petroleum import system transform into a streamlined, reliable, and environmentally friendlier system, providing both dealers and the general public with a more stable and cost-effective energy supply. *The impact is thus direct, of high in magnitude, local but long term in nature.*

b. Fuel Energy Security Enhancement

Petroleum pipelines ensure energy security by providing a resilient system that replaces vulnerable road transport. Unlike tanker fleets, which are prone to delays from traffic, weather, or accidents, pipelines offer 24/7 uninterrupted delivery. This constant flow eliminates supply gaps and maintains a predictable energy balance for the nation's infrastructure.

By moving fuel through a sealed, underground network, pipelines also protect the product's integrity and price stability. The closed system prevents theft, adulteration, and evaporation while significantly lowering long-term operational costs compared to maintaining a tanker fleet. This creates a secure, high-capacity backbone that stabilizes the economy and shields it from logistical shocks. *The impact is thus direct, of high in magnitude, regional and long term in nature.*

c. Saving the oil tanker running cost and reduce the Green House Gas emission

The average oil tanker running cost is approximately Rs. 90 to Rs. 110 per kilometer for a standard 20 KL tanker. The eastern region of Nepal imports the petroleum products roughly 10-20% of national import which is solely road based. After implementing the SJPL project, replaces hundreds of fuel tanker operating daily for importing the fuels from India to Nepal via Kakarvitta and Biratnagar which drastically reduces the Greenhouse Gases (GHG) emission and roadside air pollution. *The impact is thus direct, of medium in magnitude, local and long term in nature.*

d. Increase in local business and jobs

The operation of petroleum pipeline and GFT will not only increase the income sources of the local people, but also will open opportunities for additional businesses such as the establishment of additional food and tea shops, hotels and accommodation, groceries for serving large numbers of people. Also, the established stalls and shops will foster their business with the influx of construction workers in the project area. *The impact is thus direct, of high in magnitude, regional and long term in nature.*

7.2 Adverse Impacts

7.2.1 Petroleum Pipeline

7.2.1.1 Physical and Chemical Environment

A. Construction Phase

a. Possible damage of existing infrastructure

The infrastructure located within the highway RoW, such as electricity pole, internet cables, water supply and sewer networks are already reallocated. But, new drinking water pipeline is currently burying from Kakarbhatta to Ninda River (about 5 KM) with the upgrading work. The alignment of such pipeline is not fixed. So, precaution should be maintained during the excavation for the petroleum pipeline. *The impact during construction is predicted direct, reversible, low in magnitude, local and short term.*

b. Generation of Mock and Spoils

Excavations for trench will generate about 27,000 cubic meters of cut material. Most of the cut material can be used as backfilling material. Disposal of spoils is not anticipated due to potential reuse of all cut material. *The anticipated impacts will be low in magnitude, local and short-term.*

c. Noise and vibration

Noise levels and vibration will significantly increase during construction due to use of heavy machinery, generators, compressors and transportation of materials. This persistent exposure poses health risks to workers and disrupts both local residents and wildlife in Charali Area. Sensitive receptors like schools, hospitals and religious sites are especially vulnerable to these disturbances. So, careful construction scheduling is essential. *The anticipated impacts of noise pollution will be direct, low in magnitude, site specific and short term in nature.*

d. Temporary deterioration of air quality

Construction is set to have a significant, though temporary, impact on local air quality due to use of heavy machinery and earthworks like trenching, and pipe laying. These activities release substantial amounts of NO₂ and CO₂ making fuel combustion the lead driver of pollution during this phase. Beyond exhaust emissions, the earthworks and heavy machinery will generate considerable airborne dust and particulate matter. This isn't just a visibility issue; the dust can settle on nearby crops and impact the health of both local livestock and the community. *The anticipated impacts on air will be direct, medium in magnitude, local and short-term in nature.*

e. Water quality deterioration and sedimentation

The pipeline passes across 8 rivers/streams. During the excavation of trench, siltation from construction spoils and water contamination from oil spills may occur which could impair the beneficial use of the receiving water use. The spills could affect on aquatic life, and wildlife feeding on these water bodies. *The anticipated impacts will be direct, low in magnitude, local and short-term.*

f. Crossing across the drainage and rivers

The pipeline has to cross the 36 RCC drainages across the highway which has the width up to 6 meter and depth ranges from 3 meter to 7 meter depending upon the drain width and highway height from the ground level. During the excavation and trenching phase, frequent intersect with such drainage can leads to the road instability. *Thus, the impact due to trenching of the pipeline is expected to be direct, medium in magnitude, long term, and local in extent.*

g. Leakage of fuels and lubricants

Numerous of vehicles and heavy equipment will operate during construction pipeline alignment. There is possibility of accidental leakage of fossil fuel, lubricants, oils, acids and chemicals from such vehicles operation, if all these are not maintained properly. Exposure to these chemicals might bring health effect to the workers and directly mixing of chemicals and lubricants in the water sources can disrupt aquatic species. *The impact will be direct, low in magnitude, local and short term in nature.*

h. Backfilling and Reinstatement

Once the pipe is securely joined, the backfilling and reinstatement phase begins, which is critical for restoring the landscape's stability. Simply filling the trench is insufficient; the soil must be replaced in its original layers, and should compacted carefully to prevent future subsidence. Improper compaction can cause the ground to sink over time. *The impact will be direct, low in magnitude, local and short term in nature.*

B. Operation Phase

a. Petroleum Pipeline corrosion and leaks

The protective coating on the pipe may failed for a long time, allowing moisture to corrode the steel. Despite an intelligent pig (an internal inspection tool) passing through the pipe weeks earlier, the operator may miscalculate the rate of metal loss. *The impact will be direct, high in magnitude, local and long term in nature.*

b. Impacts due to Geological hazards

The earthquake or soil mass movement can cause pipe to bend beyond their elastic limit resulting the rupture that may create massive fire which is difficult to extinguish. *Thus, the impact due to trenching of the pipeline is expected to be direct, medium in magnitude, long term, and site specific during construction phase.*

c. Expose due to road collapse

The entire length of the petroleum pipeline in Nepal traverses the Right of Way (RoW) of high-traffic highways. Due to heavy traffic-induced stress, there is a risk of road collapse, which could expose or damage the pipeline. *The impact will be direct, predicted medium in magnitude, local and long term in nature.*

7.2.1.2 Biological Environment

I. Construction Phase

a. Possible conflict with wildlife

The wild animals especially Asian Elephants are seen occasionally in Charali Forest area. The pipeline trench of the length about 1.7 KM will traverse parallel to the Charali Forest Block. Vibration, drilling, excavation, influx of workers are the major activities that could disturb wildlife and their habitats which can rise the tension human and wildlife. ***Thus, the impact due to trenching of the pipeline is expected to be direct, medium in magnitude, short term, and local in extent during construction phase.***

b. Impacts on aquatic ecosystem

The use of HDD eliminates immediate risk to the aquatic ecosystem. However, the concern shifts to the risk of an inadvertent return, known as frac-out due to high pressure drilling fluids. ***The anticipated impacts will be direct, of low in magnitude, local and short term in nature.***

c. Disturbance to wildlife by the construction activities

Activities including excavation for the pipe laying is likely to disturb wildlife inhabited along the forest area i.e from Charali to green field terminal. Vibration, drilling, excavation, influx of workers are the major activities that will disturb wildlife and their habitats along the nearby community forest. The impact due to trenching works may pose risks to the animals, and these impacts area assessed as low in magnitude.

II. Operation Phase

The pipeline cross the eight river/stream including the Mechi River, a trans-boundary river between Nepal and India. The petroleum pipeline operational standards mitigate possible leak of petroleum products through continuous leak detection systems (LDS) and fiber-optic sensors that monitor pressure drops and vibrations, allowing for immediate shutdown of the supply flow if an anomaly is detected. So, no impact is predicted due to the operation of Petroleum pipeline on ecology.

7.2.1.3 Socio-economic and Cultural Environment**I. Construction Phase****a. Issues related to road safety and traffic disruption**

During the construction, road may temporarily be obstructed or diverted to allow for movement of heavy equipment and materials. The excavation and pipe laying activities might disruption regular traffic flow. It might also block the pedestrian lanes. There is also likelihood of increase in traffic that may increase the rate of exposure to accidents. ***The impact is direct, medium in magnitude, site specific and short time and not a significant.***

b. Blockage of Feeder Roads

Feeder road blockages during the excavation choke local connectivity with highway, triggering traffic congestion on highway. This disrupts essential supply chains, delays emergency response times, and causes distress for local communities. ***Thus, the impact is expected to be direct, medium in magnitude, short term, and site specific during construction phase.***

c. Occupational health and safety of the workers

The construction phase presents significant occupational risks, ranging from physical hazards like heavy machinery accidents and falls from heights to chronic exposure to dust, noise, and vibration. Without strict personal protective equipment (PPE) enforcement, workers can face acute injuries, respiratory issues, and eye irritation. These risks are exacerbated during high-impact activities like trenching, welding, and slope stabilization. Health risk are also associated with poor labour camp conditions, unsafe drinking water and unhygienic conditions (poor latrines conditions and washing facilities) which could cause endemic diseases such as dysentery, diarrhea and cholera. *The anticipated impacts will be direct, of high in magnitude, local and short term in nature.*

d. Potential for the conflict between workers

Conflicts between workers are typically caused by cultural diversity, wage disparities. The construction of petroleum pipeline employ a mix of local inhabitants and migrant workers. Tensions can arise from competition for work position, perceived favoritism, or cultural misunderstandings. Furthermore, the lack of effective 'Grievance Redressal Mechanisms' or poor communication from management can lead to frustration. *The anticipated impacts will be medium in magnitude, local and short-term in nature.*

e. Gender based discrimination

The project construction may disturb the local people from the non-local workers. Cases of girls and women trafficking may raise during the construction phase, and especially on the women workers, may lead to Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH). There will be also chances of discrimination in the daily wages to women workers by the contractor or sub-contractor. The women workers, may lead to Sexual Exploitation and Abuse and Sexual Harassment. *The impact will be direct, low in magnitude, local and short term in nature.*

f. Potential risk during hydro-testing

Hydrostatic testing verifies pipeline integrity but carries risks of high-pressure ruptures or blowouts. Such failures can release water with enough force to injure workers, damage property, or cause sudden soil erosion. *Thus, the impact is expected to be direct, medium in magnitude, short term, and local during construction phase.*

II. Operation Phase

a. Excavation damage by third party

Any construction near to and/across the pipeline can accidentally strike the high pressure petroleum pipeline. The dent can weakened the steel over time resulting sudden rupture. *Thus, the impact is expected to be direct, medium in magnitude, short term, and site specific during construction phase.*

b. Pipeline safety and security

Petroleum pipeline design, pipeline alignment, geo-hazards, and sabotage activities may rise the petroleum pipeline risk. These factors should be considered and integrated into the whole project safety. *The impact is direct, high in magnitude, local, long term and hence high significance.*

7.2.2 Green Field Terminal

7.2.2.1 Physical Environment

I. Construction Phase

a. Installation of labor camp and stockpiling sites

During the construction, project requires setting up various temporary sites, such as stockpiling, and workers' camps. While our priority is to use public land or open spaces to minimize disruption, there will inevitably be cases there have to use private farmland. When taken over agricultural land, even temporarily, ensure that households are fairly compensated for both the land use and the potential harvest they lose.

b. Worker generated waste management

The construction works generate wastes from workers camps and construction yards. About 50 workers live in the construction camp and the average solid waste generation per worker is 0.251 kg per day. Thus, there will be generated approximately 12.55 kg per day from the camps. Surface water may be contaminated by the run off from the waste dump especially in the rainy seasons. Improper disposal of the solid waste may also lead to pollution of air by the bad odor that emanates from the decaying waste. *Thus, the impact due to labor camp operation is expected to be direct, medium in magnitude, short term, and site specific during construction phase.*

c. Land development

The proposed land owned by the NOC is currently barren land. The land should be filled and developed to maintain the standard load bearing capacity and prevent from the possible flood during the monsoon storm. After the development of Green Field Terminal, the area of 144211.76 SQM (35.63 ACRE) barren land will transfer to the built up area. *This anticipated impact is direct in nature, high in magnitude, local in extent and long term in duration.*

d. Diversion of natural drainage

The exiting natural drainage of the length about 800 meter is to be divert as artificial channels to develop Green Field Terminal. If these diversions are not mathematically modeled for peak monsoon discharge, they cause upstream water logging leading to localized inundation of neighboring agricultural lands and create new eroded channel. *The impact is direct, high in magnitude, long term, irreversible and local in extent.*

e. Obtaining the filling materials

About 322,555 cubic meter filling material is required for land development. This huge volume of filling materials should be acquired from the legally operating or the local level designated area. *The impact is predicted, direct in nature, medium in magnitude, local in extent and short term.*

f. Air/Dust management and noise pollution

Short-term air emissions that could degrade air quality may result from terminal development and filling related activities. All diesel-powered facilities such as power generators, bulldozers, trucks and heavy machineries would emit SO_x, CO₂, CO, NO_x, VOCs and other gases. These combustion gases can cause air pollution problems and health related hazards for people in the vicinity. Besides, construction activities may create a problem of noise and vibration by construction equipment, truck traffic, work vessels and other similar sources. *The impact is direct, medium in magnitude, short term, reversible and site specific.*

II. Operation Phase

a. Terminal safety and security

Safety risks are primarily caused by the handling of flammable petroleum volumes and the potential for equipment malfunctions, such as pump failures or sensor errors. Human error during loading and Natech events, natural disasters triggering industrial accidents, pose significant threats. In the Terai, the proximity of expanding settlements to industrial zones increases the risk of casualties from potential fires or vapor cloud explosions, requiring strict adherence to international standards such as American Petroleum Institute (API) and National Fire Protection Association (NFPA) standards to ensure a resilient operational environment. *The impact is direct, high in magnitude, long term and site specific.*

b. Fire safety

Fire safety of the terminal is major concern for the whole terminal entities and community safety. The accidental leakage or damage of the storage tank can lead to the catastrophic incidents if not controlled on time. The handling of the flammable requires much more precaution and safety measures. *The issue is high in magnitude, local in extent and long term in duration.*

c. Flood and inundation risk

Flood are driven by heavy monsoon rainfall and flat topography. During operation, the terminal's large paved surfaces increase storm-water runoff significantly. If the existing natural drainage lines, are either obstructed or improperly modified or the internal drainage system is not built in proper way, water accumulates, causing localized inundation and blocking internal drainage systems, potentially destabilizing fuel storage tanks and compromising the facility's structural integrity. *This anticipated impact is direct in nature, high in magnitude, local in extent and long term in duration.*

d. Soil and water pollution

Soil and water pollution are caused by accidental leaks, spills, and ineffective wastewater management. Drip leaks from valves and loading arms accumulate over time, while major spills during tanker decanting can cause rapid contamination. Hydrocarbons like benzene can percolate through the porous soil into the shallow groundwater table. Additionally, pollution occurs if produced water or oily runoff is not properly processed in oil-water separators before

discharge. *The impact is direct, medium in magnitude, long term, irreversible and local in extent.*

e. Fugitive emission

Fugitive emission is caused by the unintentional release of vapors during storage and fuel transfer to the tanker, breathing losses due to temperature fluctuations. Additionally, exhaust from backup generators and heavy-duty vehicles contributes to the degradation of local air quality. In the humid, stagnant air of the plains, even minor leaks from valves and flanges can aggregate, creating a localized smog effect that poses long-term health risks to both the facility workforce and nearby residents. *This anticipated impact is direct in nature, medium in magnitude, site specific in extent and long term in duration.*

f. Pigging

Pigging is a system used for cleaning the pipeline of unwanted debris and check the pipeline for signs of damage or deformity in the pipeline shape. Failure of pigging system during the operation phase can lead to accidental leakages of test water causing soil and water contamination. Test water is usually hot and can induce increase in temperature of receiving water bodies. The effect is not significant, short term and reversible if the test water/debris contamination is not massive and properly contained. *Thus the predicted impact is reversible, medium in magnitude, long term, and local.*

7.2.2.2 Biological Environment

I. Construction Phase

a. Impacts on wildlife and avifauna

The increase in vehicular movements and other construction related activities would interrupt normal movement, feeding and other activities of wild animals. Similarly, electric lights in and around the construction sites and the presence of large number of humans will affect less mobile, frequently smaller species of mammals and other animals. *The impact is direct, low in magnitude, short term in duration, and local in extent.*

b. Possible of illegal hunting and poaching

The wild animals such as Asian Elephants (*Elephas maximus indicus*), Deer (*Muntiacus muntjak*), Wild Boar (*Sus scrofa*), Porcupine (*Hystrix indica*), Elongated Tortoise (*Indotestudo elongate*) are found in the Charali Forest Block. There is likely probability that illegal hunting and poaching may occur in the area. Construction workforce and the economic benefit seekers (local communities as well as the outsiders) may be involved in such activities. *So, its impact is expected to be of moderate magnitude, extent will be local and last for short period of time.*

c. Pressure on forest for fuel

The influx of workers require high amount of fuel to run the labor camp. Any shortage of domestic fuel can exert the pressure for wood for fuel. However, it is assumed that most of the labor force will be from local areas. There will be a few people from outside the project area for a short period of time. Due to this, the increase in demand of fuel wood and timber

during the construction period is expected to be low. *The impact is direct, predicted low in magnitude, short term in duration, and local in extent.*

d. Fire Hazards

Illegal entries into the Community forest near to the Terminal increase the risk of fire hazard. However, the project will introduce about the local biological environments to the foreign workers, and illegal activities that are strictly prohibited to the workers and closely monitor the workers activities. So there will be less chances of setting fire in the forest under normal condition. *Considering those facts, fire hazard by the project activities is predicted to be of low magnitude, extent will be local and last for short period of time.*

II. Operation Phase

a. Effect on flora and fauna due to accidental leak of petroleum products

Accidental leaks of petroleum products will have negative impact on flora and fauna. Oils will reduce transpiration rate and photosynthesis of plants, however, the severity of impacts depends on the amount of petroleum and on the species of plant involved. Likewise, oil spills may enter animal bodies through ingestion, inhalation, and skin absorption. Potential deterioration of thermal insulation and damage to behavior and reproductive system are some potential effects on animals upon spill pollution exposure. *The predicted impact is direct, high, local in extent, long term and hence significance.*

7.2.2.3 Socio-economic and Cultural Environment

I. Construction Phase

a. Arrangement of basic facilities and sanitation to labor camp

The needs for labor camp is caused by influx of specialized and manual laborers. Problems arise when the arrangement of facilities fails to scale with the workforce population. The primary cause of poor living conditions is often inadequate planning for proper infrastructure, including potable water supply, hygienic sewage disposal, and solid waste management. Without structured facility management, the camp can become overcrowded, leading to a degradation of living standards that directly impacts worker morale, health, and productivity. *The anticipated impacts will be medium in magnitude, local and short-term in nature.*

b. Workers occupational health and safety

Risks to workers health and safety are caused by involving heavy machinery, inadequate provision of Personal Protective Equipment (PPE), lack of safety briefings. Without a strict Occupational Health and Safety (OHS) management system, the interaction between untrained labor and heavy logistical operations leads to high rates of preventable workplace injuries. *The impact is direct, predicted medium in magnitude, short term in duration, and local in extent.*

c. Increase in traffic volume Potential increase in road traffic incidents

It is anticipated that road traffic especially from Charali Chowk to proposed Terminal, will increase during transportation of filling materials, mobilization of personnel and equipment

to site during the construction phase which is expected to last about nine months. The present condition of the road is seven meter width black top pitch although the Right of Way (RoW) is 15 meter. There is the potential for increased road traffic accidents/injuries during these phases. ***This anticipated impact is direct in nature, high in magnitude, local in extent and long term in duration.***

II. Operation Phase

a. Community health and safety

The continuous movement of fuel tankers on narrow local roads increases the frequency of traffic accidents. Additionally, the psychological stress on the community regarding a potential catastrophic failure (such as a large-scale fire) is a significant social impact. If the terminal does not maintain a transparent Community Emergency Plan and clear safety buffers, the surrounding population remains vulnerable to both daily logistical hazards and rare but high-impact disasters. ***So, its impact is expected to be of moderate magnitude, extent will be local and last for long period of time.***

b. Occupational Health and Safety

The primary issues are long-term exposure to hazardous chemicals such as petroleum vapors (VOCs) exposure to toxic fumes during tank cleaning or pressurized leaks during fuel transfer. Maintaining safety requires constant monitoring of the "Work Environment," including noise levels near pumping stations and ensuring that all automated safety overrides are functional and frequently calibrated. ***The impact is direct, predicted low in magnitude, long term in duration, and site specific in extent.***

c. Fire safety and prevention

The fugitive emission accumulation can degrade the occupational health and pose fire threats. The fire triangle (fuel, heat, and oxygen) is a constant threat in a terminal. Prevention is managed through passive fire protection such as placing and spacing and active fire protection (foam monitors and automated sprinklers). Failure to maintain the water pressure in fire hydrants or delays in detecting a leak can escalate a small flash fire into a catastrophic event. ***So, its impact is expected to be of moderate magnitude, extent will be local and last for long period of time.***

d. Possible soil and water contamination

The minor spills and the mismanagement of oily wastewater can cause soil and water quality degradation. During tanker loading and unloading, small drips of fuel can accumulate on the ground. If the Oil-Water Separator (OWS) is bypassed, these hydrocarbons wash into the soil during rain events. The primary long-term cause of concern is the leaching of petroleum products into the groundwater table. As per the locals the ground water are the main source of water and exhibit shallow aquifers, even a small, undetected leak from an underground pipe can contaminate the water source for large area. ***The impact is direct, predicted medium in magnitude, long term in duration, and site local in extent.***

CHAPTER 8: ENVIRONMENTAL IMPACTS MANAGEMENT MEASURES

Environmental study of the proposed project has addressed enhancement measures for beneficial impacts and the mitigation measures for the adverse impacts.

8.1 Beneficial Impact Augmentation Measures

The Augmentation measures for beneficial impacts are given in Table 8-I

Table 8-I: Augmentation Measures for Beneficial Impacts

Environmental Impacts	Impact Due to		Identified or Predicted	Type	Magnitude	Extent	Duration	Total Sum	Level of Significance	Augmentation Measures
	Petroleum Pipeline	Green Field Terminal								
I.	Construction Phase									
Employment Opportunities	√	√	Predicted	D	H (60)	L (20)	ST (05)	85	High significance	<ul style="list-style-type: none"> • Labor-based construction techniques will be adopted wherever possible to maximize local employment. • Encourage local residents to participate in construction, providing a significant boost to the community's economy. • Work schedules align with the agricultural off-season to ensure local people can participate without disrupting their farming activities. • Ensure the full and timely payment of all wages to workers as strictly defined in the contract agreements.

Environmental Impacts	Impact Due to		Identified or Predicted	Type	Magnitude	Extent	Duration	Total Sum	Level of Significance	Augmentation Measures
	Petroleum Pipeline	Green Field Terminal								
Increase in local people's income	√	√	Predicted	D	H (60)	L (20)	ST (5)	85	High significance	<ul style="list-style-type: none"> • Purchase construction materials (e.g., sand, gravel, bricks, etc.) from local suppliers and vendors to keep capital within the community. • Encourage the use of local services such as catering, transport, equipment rental, and maintenance workshops. • Encourage the development of small-scale tea shops, restaurants, and grocery stores near construction camps to serve the workforce.
II.	Operation Phase									
Efficient transport ation of petroleum products	√	-	Identified	D	H (60)	R (60)	LT (20)	140	High Significance	<ul style="list-style-type: none"> • Ensures a continuous and reliable flow of petroleum, eliminating shortages caused by road-based transport disruptions. • Use specialized chemical additives to reduce friction within the pipeline. • Uses automated leak detection and flow control systems to ensure high-speed, safe, and efficient delivery.

Environmental Impacts	Impact Due to		Identified or Predicted	Type	Magnitude	Extent	Duration	Total Sum	Level of Significance	Augmentation Measures
	Petroleum Pipeline	Green Field Terminal								
Fuel security enhancement	√	√	Predicted	D	H (60)	R (60)	LT (20)	140	High Significance	<ul style="list-style-type: none"> • Ensure the sufficient burial depth along the road and crossings such as rivers and drains to ensure the pipeline safety. • Cathodic Protection system will be implemented to prevent soil based corrosion and deploy Fiber-Optic Sensing to detect real time variation and obstruction. • Conduct regular ground patrol along the pipeline route.
Saving the oil tanker running cost and reduce Green House Gas Emission	√	-	Predicted	D	M (20)	L (20)	LT (20)	60	Significance	<ul style="list-style-type: none"> • The receiving terminal will equipped with high-speed, automated loading arms. • The receiving and loading of the petroleum products will be in closed system. • Vapor Recovery System (VRS) will be installed at the green field terminals to capture fuel vapors during the filling of local delivery trucks.

Environmental Impacts	Impact Due to		Identified or Predicted	Type	Magnitude	Extent	Duration	Total Sum	Level of Significance	Augmentation Measures
	Petroleum Pipeline	Green Field Terminal								
Increase in local business and job	-	√	Predicted	D	M (20)	Lo (20)	LT (20)	60	Significant	<ul style="list-style-type: none"> • Operation of GFT will increase the income sources of the local people around by opening the opportunities for additional businesses such as hotel and accommodation, the establishment of additional food and tea shops, groceries for serving large numbers of people. • Also, the established tea stalls and shops will foster their business with the influx of construction workers in the project area.

8.2 Adverse Impact Mitigation Measures

Appropriate mitigation measures are proposed for all the identified adverse impacts during construction and operation stage of the project. The mitigation measures are proposed based on the following:

- i. Corrective measures: It includes remedial measures which should reduce adverse impacts to acceptable levels.
- ii. Preventive measures: It includes measures that mitigate the serious impacts before it occurs.

The details mitigation measures on physical, chemical, biological and socio-economic and cultural environment during construction and operation stage for both component of the project are given in **Table 8-II and Table -III**.

8.2.1 Petroleum Pipeline

Table 8-II: Mitigation Measures of Adverse Impacts for Pipeline Component

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Level of Significance	Mitigation Measures
A.	Physical and Chemical Environment								
I.	Construction Phase								
Possible damage of existing infrastructure	Identified	Reversible	D	M (20)	Lo (20)	ST (05)	45	Significance	<ul style="list-style-type: none"> The pipeline excavation work will be done in coordination with the Kakarbhitta Drinking Water Committee authorities, or concern authorities. Distance between petroleum pipeline and drinking water pipeline will be maintained for the safety concern.
Generation of Mock and Spoils	Identified	Reversible	D	L (10)	Lo (20)	ST (05)	35	Low Significance	<ul style="list-style-type: none"> Most of the cut material will be used as backfilling. Disposal of spoils is not anticipated due to potential use of all cut material. If spoil disposal is needed, the terminal site will be used as spoil disposal site.

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Level of Significance	Mitigation Measures
Noise and vibration	Predicted	Reversible	D	M (20)	SS (10)	ST (05)	35	Low Significance	<ul style="list-style-type: none"> • Silencers will be installed to construction equipment and machinery and maintained properly. • Protection devices such as ear plugs/ or ear muffs will be provided to the workers during the period of operating high noise generating machines. • During construction, a noise barrier between the construction site and roadside community will be used, especially in the schools and hospitals. • Construction activities will be carried out only day time to avoid disturbance to community. • Periodic noise quality monitoring will be carried out in the project area to ensure compliance with national noise quality.
Temporary deterioration of air quality	Predicted	Reversible	D	M (20)	Lo (20)	ST (5)	45	Significance	<ul style="list-style-type: none"> • Pipeline laying and trenching will be performed in manageable segments to limit the duration of soil exposure. • The project will plant and maintain native evergreen trees in areas if there have been damaged or cleared, which serve as biological filters for air pollutants and natural sound buffers. • Regular air quality testing will be conducted along the pipeline route, terminal sites, and construction camps to ensure compliance with National and WHO standards.

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Level of Significance	Mitigation Measures
Water quality deterioration and sedimentation	Predicted	Reversible	D	L (10)	Lo (20)	ST (5)	35	Low Significance	<ul style="list-style-type: none"> Trenching across water bodies will be conducted using horizontal directional drilling (HDD). The construction work will avoid during the monsoon season.
Crossing across the river and drains	Identified	Irreversible	D	M (20)	Lo (20)	LT (20)	60	Significance	<ul style="list-style-type: none"> The project will utilize Horizontal Directional Drilling (HDD) to lay the pipe deep beneath the riverbed, avoiding any physical disturbance to the banks.
Leakage of fuels and lubricants	Predicted	Irreversible	D	L (10)	SS (10)	ST (5)	35	Low Significance	<ul style="list-style-type: none"> Portable spill kits (containing absorbent pads, booms, and sawdust) will be deployed at every active work site, and all operators will be trained in immediate containment procedures. Regular inspection of machinery used will be done to prevent leaks.
Backfilling and reinstatement	Identified	Irreversible	D	L (10)	Lo (20)	ST (5)	35	Low Significance	<ul style="list-style-type: none"> Backfilling will be performed immediately after pipe laying to minimize the duration of stockpiling, and any excess soil will be disposed of at pre-approved, engineered tipping sites.
II.	Operational Phase								

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Level of Significance	Mitigation Measures
Petroleum Pipeline corrosion and leaks	Predicted	Irreversible	D	H (60)	Lo (20)	LT (20)	100	High Significance	<ul style="list-style-type: none"> The pipeline will be coated with a Cathodic Protection (CP) system to prevent rust and external corrosion. A SCADA system will be installed for real-time pressure drops and vibration monitoring and immediate hazard identification. The system will undergo hydrostatic testing at 125% of operating pressure to verify weld integrity.
Impacts due to Geological Hazards	Predicted	Reversible	D	M (20)	Lo (20)	LT (20)	60	Significance	<ul style="list-style-type: none"> The pipeline will be constructed using high-ductility steel and flexible joints to absorb ground movement without rupturing. At all river crossings, the pipe will be buried at least 4–6 meters below the maximum scour depth to prevent exposure or damage during flash floods. The project will integrate vibration and strain-gauge sensors linked to the SCADA system to automatically shut off fuel flow the moment a seismic or accidental event is detected.

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Level of Significance	Mitigation Measures
Expose due to road collapse	Predicted	Reversible	D	M (20)	Lo (20)	LT (20)	60	Significance	<ul style="list-style-type: none"> The pipeline will be installed at a minimum depth of 1.2–2 meters and placed at a safe horizontal distance from the road shoulder to ensure the pipe remains covered even if the top layer of the embankment fails. At vulnerable sections of the road, the project will construct gabion walls or reinforced concrete retaining structures to stabilize the shoulder and prevent lateral movement. The project will implement regular on foot inspection along the pipeline route for early detection of shoulder cracks.
B.	Biological Environment								
I.	Construction Phase								
Possible conflict with wildlife	Predicted	Reversible	D	M (20)	Lo (20)	ST (5)	45	Significance	<ul style="list-style-type: none"> Pipeline trenching work will be on daylight hours while working near to the forest. The existing fencing will maintain effectively for the proper function in coordination with forest authorities.

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Level of Significance	Mitigation Measures
Impacts on aquatic ecosystem	Predicted	Reversible	InD	L (20)	Lo (20)	ST (5)	45	Significance	<ul style="list-style-type: none"> The use of HDD eliminates immediate risk to the aquatic ecosystem. However, the concern shifts to the risk of an inadvertent return, known as frac-out due to high pressure drilling fluids.
Disturbance to wildlife	Identified	Reversible	D	SS (10)	Lo (20)	ST (5)	35	Low Significance	<ul style="list-style-type: none"> Disturbance to wildlife and its habitat by the construction works will be avoided as far as possible. Construction work will be in daytime that minimize disturbance to wildlife. Fencing/netting can be constructed to control noise from heavy equipment. Proper lightning system shall be installed in the construction area.
C.	Socio-Economic and Cultural Environment								
I.	Construction Phase								

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Level of Significance	Mitigation Measures
Issues related to road safety and traffic disruption	Predicted	Reversible	D	M (20)	SS (10)	ST (5)	35	Low Significance	<ul style="list-style-type: none"> High-visibility barriers, reflective safety tape will be installed around every open trench and equipment staging area to prevent vehicles or pedestrians from accidentally entering the work zone. All project-related vehicles will be restricted to a maximum speed of 20–30 km/h in residential zones and will travel in timed convoys. The project will maintain a dedicated to provide immediate medical assistance in the event of any road incident.
Blocked of feeder road	Identified	Reversible	D	M (20)	Lo (20)	ST (5)	45	Significance	<ul style="list-style-type: none"> Retro reflective warning signs, and barrier will be installed ahead of the highway intersection to alert highway commuters. The alternative route will be utilized for the access to the highway.

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Level of Significance	Mitigation Measures
Occupational health and safety of the workers	Identified	Reversible	D	H (60)	Lo (20)	ST (5)	85	High Significance	<ul style="list-style-type: none"> The project mandates daily and weekly toolbox talks for all workers, supported by a visual communication strategy using posters, booklets, and safety signage across all worksites. All personnel and visitors will be equipped with job-specific PPE, and the sites will be supported by immediate first aid, and rescue facilities for emergencies. OHS Plan will be developed and strictly implemented under the close monitoring of a designated OHS officer to ensure compliance and safety. Worker camps will be fully equipped with sanitation, kitchens, and other facilities minimize external social friction with local communities.
Potential for the conflict between the workers	Predicted	Reversible	InD	M (20)	Lo (20)	ST (5)	45	Significance	<ul style="list-style-type: none"> The project will conduct orientations and toolbox talks to bridge language gaps and establish a unified safety culture. Project will establish grievance redressal unit to resolve the issues that arise during construction.

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Level of Significance	Mitigation Measures
Gender based discrimination	Predicted	Reversible	InD	M (20)	Lo (20)	ST (5)	45	Significance	<ul style="list-style-type: none"> Awareness to communities, particularly women, and male and female, children to understand risks of SEA and SH and the roles and responsibilities of parties involved in project implementation on SEA and SH prevention, reporting incidents of project-related SEA/SH. Provide same wages for men and women for same nature of works. Posting of Code of Conduct at contractor's work camps and living areas, and public places of adjoining/neighborhood communities in Nepali language.
II.	Operational Phase								
Third party Interference	Predicted	Reversible	InD	H (60)	Lo (20)	LT (20)	100	High Significance	<ul style="list-style-type: none"> A bright yellow warning tape will be buried 300-500 mm above the pipe to alert excavation. Yellow marker will be placed every 100-200 meter as route marker along the pipeline. NOC enforce a central "One-Call" center that contractors (third party) must contact before any mechanical excavation. Contractors must take reasonable steps to manually verify (by hand-digging) the exact location and depth of a pipe before using heavy machinery, rather than relying solely on map data.

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Level of Significance	Mitigation Measures
Pipeline safety and security	Identified	Reversible	D	H (60)	Lo (20)	LT (20)	100	High Significance	<ul style="list-style-type: none"> The design factor of pipe will be in such a way that withstand external loads and traffic vibration as per Indian Standards. The pipe will be laid at the edge of the RoW of the highway i.e. within the 2 M from edge, to reduce the load pressure and vibration exerted due to traffic. The burial depth of the pipe will be not less than 1.2 meter from the road surface. The pipeline route will monitored by patrolling.

Note

Type: D: Direct, InD: Indirect

Magnitude: L= Low (10) M= Medium (20) H= High (60)

Extent: SS= Site Specific (10) Lo= Local (20) R= Regional (60)

Duration: ST= Short Term (05) MT= Medium Term (10) LT= Long Term (20)

8.2.2 Green Field Terminal

Table 8-III: Mitigation Measures of Adverse Impacts

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Significance	Mitigation Measures
A.	Physical and Chemical Environment								
I.	Construction Phase								
Installation of camp sites and stockpiling sites	Identified	Reversible	D	M (20)	L (20)	ST (5)	45	Significance	<ul style="list-style-type: none"> The camp site will be within the terminal property and barricaded to ensure the safety of local residents and their properties. Materials will be covered with tarpaulins and enclosed with side barriers to prevent dust and erosion. Hazardous chemicals will be stored on hard, impermeable surfaces to protect soil and water from contamination.
Worker-generated waste.	Identified	Reversible	D	M (20)	Lo (20)	ST (5)	45	Significance	<ul style="list-style-type: none"> The project will implement a mandatory three-bin system (biodegradable, recyclable, and hazardous) at construction camps and work sites to ensure waste is sorted at the source. The project will establish partnerships with local municipal waste management authorities for regular collection and ensure that all temporary camps are fully cleared of waste upon completion.

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Significance	Mitigation Measures
Land development	Identified	Irreversible	D	M (20)	SS (10)	LT (20)	50	Significance	<ul style="list-style-type: none"> • The wall of three meter height will be constructed at the edges of the fill area to secure the perimeter. • Fill material will be sourced only from government-approved borrow pits or quarries. • Land filling will be carried out in layers and each layer will be mechanically compacted to prevent possible future land subsidence (sinking) and soil erosion. • To prevent waterlogging in and surrounding areas, a peripheral drainage system will be constructed around the inside and outside the boundary wall. • A green buffer zone will be maintained between the newly developed GFT site and existing agricultural or residential lands to protect the visual landscape. • Before land filling or development begins, the top fertile soil will be stripped and banked that will later be used to landscape the greenery area in and around the terminal.

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Significance	Mitigation Measures
Diversion of Natural Drainage	Identified	Irreversible	D	H (60)	Lo (20)	LT (20)	100	High Significance	<ul style="list-style-type: none"> The diverted canal of the 2 meter width and 1-1.5 meter depth will be constructed just outside of the boundary wall. The diverted canal will be linked to the existing in and out flow. Strom water drain network will be developed within the terminal to prevent possible water logging issue.
Obtaining the filling material	Identified	Irreversible	D	M (20)	Lo (20)	ST (5)	45	Significance	<ul style="list-style-type: none"> The filling materials will be obtained from legally operating quarry/crusher industries. The industry must have permission/approval from the concern authorities. The quality of filling materials will be ensured at the filling site (Terminal) by engineers.

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Significance	Mitigation Measures
Air quality degradation and noise pollution	Predicted	Reversible	D	M (20)	Lo (20)	ST (5)	45	Significance	<ul style="list-style-type: none"> All trucks carrying filling materials to the site will be mandatory covered with tarpaulins to prevent spillage on public roads. Maintenance of the access road surface to ensure smooth traffic flow and reduced vehicular noise. Implementation of No Blowing of Horn Zones particularly in settlement areas, sensitive areas. The DG Sets shall be acoustically insulated resulting in reduction of noise as per limit prescribed by government. The exhaust pipe from DG set shall be taken above as per pollution control norms. Periodic air and noise quality monitoring will be conducted at and around the terminal to ensure the effectiveness of these interventions.
II.	Operation Phase								
Terminal Safety and Security	Identified	Reversible	D	H (60)	SS (10)	LT (20)	80	Significance	<ul style="list-style-type: none"> The wall of three meter height will be constructed at the edges of the fill area to secure the perimeter. The terminal will be guard by the Nepal Army to provide external security. 24/7 security guard will be at the gate. Integrated CCTV monitoring system will be installed. An authorized person will get access into the terminal.

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Significance	Mitigation Measures
Fire safety concern	Identified	Reversible	D	H (60)	Lo (20)	LT (20)	100	High Significance	<ul style="list-style-type: none"> The layout and tank separation distance will be as of the Indian Oil Safety Directorates standards (OISD-STD-118) to prevent a fire in one area from spreading to another. The Green Field Terminal will have equipped with fire protection facilities such as two fire water tank with the capacity of each of 16 M diameter and 18.5 M height, fire pump, foam pump and fire hydrant network.
Flood/Inundation risk	Identified	Reversible	D	H (60)	Lo (20)	LT (20)	100	High Significance	<ul style="list-style-type: none"> The elevation of terminal is gained as per the flood and inundation analysis of nearby Phulbasa River. The peripheral drainage systems will be engineered in a way that ensure terminal resilience during extreme weather. A peripheral drains of 2 M width and 1-1.5 M depth will be constructed to intercept off-site runoff and prevent the damming effect on upstream areas. An efficient drainage network will be developed within the GFT to manage in-site run-off.

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Significance	Mitigation Measures
Soil and Water pollution	Predicted	Reversible	D	M (20)	Lo (20)	LT (20)	60	Significance	<ul style="list-style-type: none"> The HSD and MS storage tanks will be surrounded by a dyke wall capable of holding the 110% volume of entire tanks in that enclosure. In areas designated for vehicle parking, and fueling, specialized oil-water separators of 35Mx15M will be integrated into the drainage system to ensure that any fuel or lubricant leaks are filtered out before the water is discharged. Rapid-response spill kits (containing absorbent mats and sand) will be stationed at all high-risk locations.

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Significance	Mitigation Measures
Fugitive emission	Predicted	Reversible	D	M (20)	SS (10)	LT (20)	50	Significance	<ul style="list-style-type: none"> • Use of floating roofs on storage tanks to reduce the opportunity for volatilization by eliminating the headspace present in conventional storage tanks. • Specialized systems will be installed at fueling stations to capture Volatile Organic Compounds (VOCs). • Vapor Recovery Units (VRU): VRUs will be installed at loading bay to convert vapors back into liquid product. • Bottom Loading Systems: bottom loading will be adopted to minimize turbulence and associated vapor generation during tanker filling. • Leak Detection and Repair program will be implemented. • Frequent air and noise monitoring will be conducted at working and sensitive areas to ensure continuous compliance.

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Significance	Mitigation Measures
Pigging	Predicted	Reversible	D	M (20)	Lo (20)	LT (20)	60	Significance	<ul style="list-style-type: none"> The step-by-stem approach will be adopted to reduce the major blockage and to maintain the pipeline integrity. The system will be real time tracking and pressure monitoring system. The whole pigging will keep in closed system and waste will be discharged as per the national effluent standards.
B.	Biological Environment								
I.	Construction Phase								
Impacts on wildlife and avifauna	Predicted	Reversible	D	L (10)	Lo (20)	ST (5)	35	Low Significance	<ul style="list-style-type: none"> Mandatory environmental induction programs will be conducted for all staff to educate them on protected species and the legal consequences of wildlife crimes. Illegal activities such as poaching, trapping, or unauthorized tree felling will strictly prohibited to the workers. The project will provide subsidized LPG or electric cooking facilities at labor camp. All hot work (welding, cutting, grinding) will be done with fire precaution measures.

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Significance	Mitigation Measures
Illegal wildlife hunting and poaching	Predicted	Irreversible	InD	L (10)	Lo (20)	ST (5)	35	Low Significance	<ul style="list-style-type: none"> The project workers will strictly be prevented from hunting and poaching and any other kind of illegal activities. Informative and warning sign will be placed at relevant construction sites. The contractor who is liable to control his labor in this regard will be instructed strictly for application of specification regarding hunting and poaching control.
Pressure on forests for fuel and forest products	Predicted	Reversible	InD	L (10)	Lo (20)	ST (5)	35	Low Significant	<ul style="list-style-type: none"> Use of forest wood will be prohibited for meeting the fuel needs. Construction contractor will provide necessary household fuels such as kerosene or LPG for cooking.
Forest fire	Predicted	Reversible	InD	M (20)	Lo (20)	ST (5)	45	Significance	<ul style="list-style-type: none"> Project will introduce about the local biological environments to the foreign workers, illegal activities that are strictly prohibited. The contractor will closely monitor the workers activities and instruct no to enter into the forest area.
II.	Operation Phase								

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Significance	Mitigation Measures
Effect on flora and fauna due to accidental leak of petroleum products	Predicted	Reversible	D	M (20)	SS (10)	LT (20)	50	Significant	In case of accidental leak of petroleum products, the soil will be treated by biodegradation method. This treatment also combines injection of degrading bacteria and nutrients into soil to stimulate biodegradation.
C.	Socio Economic and Cultural Environment								
I.	Construction Phase								
Arrangement of basic facilities	Identified	Reversible	D	M (20)	Lo (20)	ST (5)	45	Significant	<ul style="list-style-type: none"> • Adequate space for the living area will be arranged for the worker inside the terminal. • The sanitation facilities such as toilets and bathing area will be design at appropriate location and distance. • The household and sanitation water will be sourced from the tube well inside the terminal. • The electricity will obtained from the Nepal Electricity Authority (NEA) and will have a DG set for backup source. • Color-coded bins will be placed at the construction site to segregate the waste at source.

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Significance	Mitigation Measures
Workers occupational health and safety	Identified	Reversible	D	M (20)	Lo (20)	ST (5)	45	Significant	<ul style="list-style-type: none"> Conducted daily/weekly toolbox talks and uses visual signage to ensure continuous worker education on safety risks. There will have mandates full personal protective equipment for all staff and visitors, supported by on-site first aid at worksites and camps. The construction activities will be according to the Occupational Health and Safety (OHS) standards.
Increase in traffic volume Potential increase in road traffic incidents	Predicted	Reversible	D	M (20)	Lo (20)	LT (20)	60	Significant	<ul style="list-style-type: none"> Large and slow moving vehicles will be scheduled during off peak periods Ensures maintenance of all roads of any damage caused by project Mobilization of project associated vehicles during off peak period. Visible warning signs on roads and terminal shall be installed. First aid training of workforce and provision of first aid boxes in operational vehicles.
II.	Operation Phase								

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Significance	Mitigation Measures
Community Health and Safety	Predicted	Irreversible	D	H (60)	Lo (20)	LT (20)	100	Highly Significant	<ul style="list-style-type: none"> Quantitative Risk Assessment (QRA): A community-integrated ERP will be developed. This includes installing a Public Address (PA) system and sirens to warn neighbors in the event of an emergency, with pre-defined evacuation routes for the village. The fuel tanker won't be parked on the roadside. Green area and buffer zone will be maintained inside terminal and perimeter. All the products produced within the terminal will be treated on site before discharged. A Community Feedback Box and a 24/7 hotline will be established, allowing neighbors to report concerns regarding noise, dust, or driver behavior for immediate resolution.
Occupational Health and Safety	Identified	Reversible	D	M (20)	SS (10)	LT (20)	50	Significant	<ul style="list-style-type: none"> Hazardous Zone Classification: The terminal will be mapped into zones (Zone 0, 1, and 2) based on the risk. A mandatory PPE policy will be enforced.

Environmental Impacts/Issues	Identified or Predicted	Nature	Type	Magnitude	Extent	Duration	Total Sum	Significance	Mitigation Measures
Fire safety and prevention	Identified	Reversible	D	H (60)	Lo (20)	LT (20)	100	Significant	<ul style="list-style-type: none"> Vapor Recovery Units (VRU) will be installed to capture flammable gases during loading, reducing the risk of an explosive atmosphere. A fire hydrant system with dedicated, high-capacity two water tank of capacity 3719.64 KL of each will be maintained on Terminal. Portable Dry Chemical Powder (DCP) and CO₂ extinguishers will be placed in all operational areas. A dedicated Foam Tender fire extinguisher vehicle will be on stand.
Possible soil and water contamination	Predicted	Reversible	D	M (20)	Lo (20)	LT (20)	80	Significant	<ul style="list-style-type: none"> Site drainage will be routed through 35Mx15M oil water separators. These remove free-floating oil and solids before discharge. A 100KL capacity sludge tank will be installed. Monitoring ground water quality to ensure no hydrocarbons seepage.

Note**Type:**

D: Direct, InD: Indirect

Magnitude:

L= Low (10)

M= Medium (20)

H= High (60)

Extent:

SS= Site Specific (10)

Lo= Local (20)

R= Regional (60)

Duration:

ST= Short Term (05)

MT= Medium Term (10)

LT= Long Term (20)

8.3 Environmental Management Plan

The Environmental Management Plan (EMP) serves as a strategic framework designed to systematically mitigate or reduce adverse environmental impacts to acceptable levels. The Environmental Management Plan (EMP) presents the set of mitigation and management measures to be taken its location, timeframe, cost for implementation and institutional arrangement to ensure that no significant adverse impacts will be occurred from the project intervention.

8.3.1 EMP for the Petroleum Pipeline

Table 8-IV: Environment Management Plan for the Petroleum Pipeline

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility for the Implementation	Approximate Budget (Rs.)	Monitoring and Evaluation
A.	Physical and Chemical Environment						
A.1	Construction Phase						
1.1	Generation of Mock and Spoils	The cut material will be used as backfilling.	Along the pipeline route	Construction	Contractor		NOC/Municipal ity
		If spoil disposal is needed, the terminal site will be used as spoil disposal site.	Pipeline route and terminal	Construction	Contractor		NOC
1.2	Noise and vibration	Silencers will be installed to construction equipment and machinery and maintained properly.	Construction site	Construction	Contractor		NOC
		Protection devices such as ear plugs/ or ear muffs will be provided to the workers during the period of operating high noise generating machines.	Construction sites along the alignment	Construction	Contractor		
		Noise barrier between the construction site and roadside community will	Construction sites	Construction	Contractor		NOC

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility for the Implementation	Approximate Budget (Rs.)	Monitoring and Evaluation
		be used, especially in the schools and hospitals.					
		Construction activities will be carried out only day time to avoid disturbance to community.	Construction sites	Construction	NOC/Contractor		NOC
1.3	Temporary deterioration of air quality	Pipeline laying and trenching will be performed in manageable segments to limit the duration of soil exposure.	Construction sites	Construction	NOC/Contractor		NOC
		Regular air quality testing will be conducted along the pipeline route, terminal sites, and construction camps to ensure compliance with National and WHO standards.	Construction sites	Construction	NOC/Contractor		DoEConsultant
1.4	Water quality deterioration and sedimentation	Trenching across water bodies will be conducted using horizontal directional drilling (HDD).	Mechi River, Mechi Bhansar area, and other rivers that cross the pipeline	Construction	Contractor		NOC
		The construction work will avoid during the monsoon season.	Construction site	Construction	NOC/Contractor		NOC
1.5	Crossing across the river and drains	The project will utilize Horizontal Directional Drilling (HDD) to lay the pipe deep beneath the riverbed, avoiding any	Mechi River, Mechi Bhansar area, and other rivers that cross the pipeline	Construction	Contractor		NOC

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility for the Implementation	Approximate Budget (Rs.)	Monitoring and Evaluation
		physical disturbance to the banks.					
1.6	Leakage of fuels and lubricants	Portable spill kits (containing absorbent pads, booms, and sawdust) will be deployed at every active work site.	Construction site	Construction	NOC/Contractor		NOC
		Regular inspection of machinery used will be done to prevent leaks.	Construction site	Construction	Contractor		NOC
1.7	Backfilling and reinstatement	Backfilling will be performed immediately after pipe laying to minimize the duration of stockpiling, and any excess soil will be disposed of at pre-approved, engineered tipping sites.					
A.2	Operation Phase						
2.1	Petroleum Pipeline corrosion and leaks	The pipeline will be coated with a Cathodic Protection (CP) system to prevent rust and external corrosion.	Along the pipeline	Operation	NOC		NOC
		A SCADA system will be installed for real-time pressure drops and vibration monitoring and immediate hazard identification.					

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility for the Implementation	Approximate Budget (Rs.)	Monitoring and Evaluation
		The system will undergo hydrostatic testing at 125% of operating pressure to verify weld integrity.					
2.2	Impacts due to Geological Hazards	The pipeline will be constructed using high-ductility steel and flexible joints to absorb ground movement without rupturing.	Along the pipeline	Operation	NOC		NOC
		At all river crossings, the pipe will be buried at least 4–6 meters below the maximum scour depth to prevent exposure or damage during flash floods.	HDD locations	Operation	NOC		NOC
		The project will integrate vibration and strain-gauge sensors linked to the SCADA system to automatically shut off fuel flow the moment a seismic or accidental event is detected.	Along the pipeline	Operation	NOC		NOC
2.3	Expose due to road collapse	The pipeline will be installed at a minimum depth of 1.2–2 meters and placed at a safe horizontal distance from the road shoulder to	Along the pipeline	Operation	NOC		NOC

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility for the Implementation	Approximate Budget (Rs.)	Monitoring and Evaluation
		ensure the pipe remains covered.					
		The project will implement regular on foot inspection along the pipeline route for early detection of shoulder cracks.	Along the pipeline route	Operation	NOC		NOC
B.	Biological Environment						
B.1	Construction Phase						
1.1	Possible conflict with wildlife	Pipeline trenching work will be on daylight hours while working near to the forest.	Along the pipeline route	Construction	NOC/Contractor		NOC/DFO/CFUG
		The existing fencing will maintain effectively, if necessary, for the proper function in coordination with forest authorities.	Charali Chowk to Green Field Terminal	Construction	NOC/Contractor		NOC/DFO/CFUG
C.	Socio-economic and Cultural Environment						
C.1	Construction Phase						
1.1	Potential increase in road incidents	High-visibility barriers, reflective safety tape will be installed around every open trench and equipment staging area to prevent vehicles or pedestrians from accidentally entering the work zone.	Construction Sites	During Construction	NOC/Contractor		NOC
		All project-related vehicles will be restricted	Along the pipeline route	During Construction	NOC/Contractor		NOC

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility for the Implementation	Approximate Budget (Rs.)	Monitoring and Evaluation
		to a maximum speed of 20–30 km/h in residential zones and will travel in timed convoys.					
1.2	Blocked of feeder road	Retro reflective warning signs, and barrier will be installed ahead of the highway intersection to alert highway commuters.	Construction Site	During Construction	NOC/Contractor		NOC
		The alternative route will be utilized for the access to the highway.					
1.3	Occupational health and safety of the workers	The project mandates daily and weekly toolbox talks for all workers, supported by a visual communication strategy using posters, booklets, and safety signage.	Across all worksites	During Construction	NOC/Contractor		NOC
		All personnel will be equipped with job-specific PPE, and the sites will be supported by immediate first aid facilities.	Working Sites	During Construction	NOC/Contractor		NOC
1.4	Potential for the conflict between the workers	The project will conduct orientations and toolbox talks to bridge language gaps and establish a unified safety culture.	Construction Sites	Before and during construction	NOC/Contractor		NOC
		Project will establish grievance redressal unit	Project area	During Construction	NOC/Contractor		NOC

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility for the Implementation	Approximate Budget (Rs.)	Monitoring and Evaluation
		to resolve the issues that arise during construction.					
2.	Operation Phase						
2.1	Third party Interference	A bright yellow warning tape will be buried 300-500 mm above the pipe to alert excavation.	Along the pipeline route	During Construction and operation	NOC		NOC
		Yellow marker will be placed every 100-200 meter as route marker.					
		NOC enforce a central Call-Center that third party must contact before any mechanical excavation.	Project site	During operation	NOC		
		Contractors must take reasonable steps to manually verify the exact location and depth of a pipe before using heavy machinery, rather than relying solely on map data.	Along the pipeline route	During the operation			
2.2	Pipeline safety and security	The design factor of pipe will be in such a way that withstand external loads and traffic vibration as per Indian Standards.					
		The pipe will be laid at the edge of the RoW of the highway i.e. within the 2 M from edge, to reduce the load pressure	Along the pipeline route	During the construction and operation	NOC		NOC

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility for the Implementation	Approximate Budget (Rs.)	Monitoring and Evaluation
		and vibration exerted due to traffic.					
		The burial depth of the pipe will be not less than 1.2 meter from the road surface.					
		The pipeline route will monitored by patrolling.		During the operation			

8.3.2 EMP for the Green Field Terminal

Table 8-V: EMP for the Green Field Terminal

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility	Approximate Budget (Rs.)	Monitoring and Evaluation
A.	Physical and Chemical Environment						
1.	Construction Phase						
1.1	Installation of camp sites and stockpiling sites	<ul style="list-style-type: none"> The camp site will be within the terminal property and barricaded to ensure the safety of local residents and their properties. Materials will be covered with tarpaulins and enclosed with side barriers to prevent dust. Materials will be covered with tarpaulins and enclosed with side barriers to prevent dust. 	GFT	Before and During Construction	Contractor		NOC
		<ul style="list-style-type: none"> Hazardous chemicals will be stored on hard, impermeable surfaces to protect soil and water from contamination. 	GFT	During Construction	Contractor		NOC
1.2	Worker-generated waste.	<ul style="list-style-type: none"> The project will implement a mandatory three-bin system (biodegradable, recyclable, and hazardous) to ensure waste is sorted at the source. 	At construction camp and work sites				

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility	Approximate Budget (Rs.)	Monitoring and Evaluation
		<ul style="list-style-type: none"> The project will establish partnerships with local municipal waste management authorities for regular collection and ensure that all temporary camps are fully cleared of waste upon completion. 					
1.3	Land development	<ul style="list-style-type: none"> Before land filling, the top fertile soil will be stripped and banked that will later be used to landscape the greenery area in and around the terminal. 	FGT	During Construction	Contractor		NOC
		<ul style="list-style-type: none"> Wall of three (3) meter height will be constructed at the edges of the fill area to secure the perimeter. 	GFT Sites	During Construction	Contractor		NOC
		<ul style="list-style-type: none"> Land filling will be carried out in layers and each layer will be mechanically compacted to prevent possible future land subsidence/sinking. 	GFT	During Construction	Contractor		NOC
		<ul style="list-style-type: none"> A green buffer zone will be maintained between the newly developed GFT site 	GFT	During Construction	Contractor		NOC

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility	Approximate Budget (Rs.)	Monitoring and Evaluation
		and existing agricultural or residential lands to protect the visual landscape.					
1.4	Diversion of Natural Drainage	<ul style="list-style-type: none"> • The diverted canal of the 2 meter width and 1-1.5 meter depth will be constructed just outside of the boundary wall. • The diverted canal will be linked to the existing in and out flow. • Storm water drain network will be developed within the terminal to prevent possible water logging issue. 					
1.5	Obtaining the filling material	<ul style="list-style-type: none"> • The filling materials will be obtained from legally operating quarry/crusher industries. The industry must have permission/approval from the concern authorities. • The quality of filling materials will be ensured at the filling site (Terminal) by engineers. 	Quarries sites and GFT	During Construction	Contractor		NOC/ Municipality
1.6	Air quality degradation	<ul style="list-style-type: none"> • All trucks carrying filling materials to the site will be 	Material carrying trucks, access road,	During Construction	NOC	Provisioned in provisional sum	NOC, Municipality

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility	Approximate Budget (Rs.)	Monitoring and Evaluation
	and noise pollution	<p>mandatory covered with tarpaulins to prevent dust and spillage on public roads.</p> <ul style="list-style-type: none"> • Maintenance of the access road surface to ensure smooth traffic flow and reduced vehicular noise. • Implementation of No Blowing of Horn Zones particularly in settlement areas, sensitive areas. • Periodic air and noise quality monitoring will be conducted at and around the terminal to ensure the effectiveness of these interventions. 	from Charali Chock to Terminal, Terminal and periphery community				
2.	Operation Phase						
2.1	Terminal Safety and Security	<ul style="list-style-type: none"> • The wall of three meter height will be constructed at the edges of the fill area to secure the perimeter. • The terminal will be guard by the Nepal Army to provide external security. 	GFT	During Construction and Operation	NOC		NOC

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility	Approximate Budget (Rs.)	Monitoring and Evaluation
		<ul style="list-style-type: none"> • 24/7 security guard will be at the gate. • Integrated CCTV monitoring system will be installed. • An authorized person will get access into the terminal. 					
2.2	Fire safety concern	<ul style="list-style-type: none"> • The storage tank layout and inter-tank separation distance will be as of the Indian Oil Safety Directorates standards (OISD-STD-118) to prevent a fire in one area from spreading to another. • The Green Field Terminal will have equipped with fire protection facilities such as two fire water tank with the capacity of each of 16 M diameter and 18.5 M height, fire pump, foam pump and fire hydrant network. 	GFT	Construction and Operation	NOC	Provisioned in provisional sum	NOC
2.3	Flood/Inundation risk	<ul style="list-style-type: none"> • The elevation of terminal is gained as per the flood and 	GFT	Construction and Operation	NOC/Terminal Development Contractor	Included in GFT development	

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility	Approximate Budget (Rs.)	Monitoring and Evaluation
		<p>inundation analysis of nearby Phulbasa River.</p> <ul style="list-style-type: none"> • A peripheral drains of 2 M width and 1-1.5 M depth will be constructed to intercept off-site runoff and prevent the damming effect on upstream areas. • An efficient drainage network will be developed within the GFT to manage in-site run-off. 					
2.4	Soil and Water pollution	<ul style="list-style-type: none"> • The HSD and MS storage tanks will be surrounded by a dyke wall capable of holding the 110% volume of entire tanks in that enclosure. • In areas designated for vehicle parking, and fueling, specialized oil-water separators of 35Mx15M will be integrated into the drainage system to ensure that any fuel or lubricant leaks are 	GFT	During Construction and Operation	NOC	Included in project cost	NOC

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility	Approximate Budget (Rs.)	Monitoring and Evaluation
		filtered out before the water is discharged.					
2.5	Fugitive emission	<ul style="list-style-type: none"> Specialized systems will be installed at fueling stations to capture Volatile Organic Compounds (VOCs). Vapor Recovery Units (VRU): VRUs will be installed at loading bay to convert vapors back into liquid product. Bottom Loading Systems: bottom loading will be adopted to minimize turbulence and associated vapor generation during tanker filling. Leak Detection system will be implemented. 	GFT	During Operation	NOC	Provisioned in provisional sum	NOC
2.6	Pigging	<ul style="list-style-type: none"> The step-by-stem approach will be adopted to reduce the major blockage and to maintain the pipeline integrity. 	GFT	During Operation	NOC	Provisioned in provisional sum	NOC

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility	Approximate Budget (Rs.)	Monitoring and Evaluation
		<ul style="list-style-type: none"> The system will be real time tracking and pressure monitoring system. The whole pigging will keep in closed system and waste will be discharged as per the national effluent standards. 					
B.	Biological Environment						
1.	Construction Phase						
1.1	Impacts on wildlife and avifauna	<ul style="list-style-type: none"> Mandatory environmental induction programs will be conducted for all staff to educate them on protected species and the legal consequences of wildlife crimes. The project will provide subsidized LPG or electric cooking facilities at labor camp. All hot work (welding, cutting, grinding) will be done with fire precaution measures. 	GFT	During Construction	NOC/Contract or		NOC
1.2	Illegal wildlife	<ul style="list-style-type: none"> The project workers will strictly be prevented from hunting and poaching and 	GFT	During Construction	NOC/Contract or		NOC

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility	Approximate Budget (Rs.)	Monitoring and Evaluation
	hunting and poaching	<p>any other kind of illegal activities.</p> <ul style="list-style-type: none"> Informative and warning sign will be placed at relevant construction sites. 					
1.3	Pressure on forests for fuel and forest products	<ul style="list-style-type: none"> Use of forest wood will be prohibited for meeting the fuel needs. Construction contractor will provide necessary household fuels such as kerosene or LPG for cooking. 	GFT	During Construction	Terminal Development Contractor	Included in Camp installation cost	NOC
C.	Socio-economic and Cultural Environment						
1.	Construction Phase						
1.1	Arrangement of basic facilities	<ul style="list-style-type: none"> Adequate space for the living area will be arranged for the worker inside the terminal. The sanitation facilities such as toilets and bathing area will be design at appropriate location and distance. The household and sanitation water will be 	GFT	During Construction	Terminal Development Contractor		NOC

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility	Approximate Budget (Rs.)	Monitoring and Evaluation
		<p>sourced from the tube well inside the terminal.</p> <ul style="list-style-type: none"> The electricity will be obtained from the Nepal Electricity Authority (NEA) and will have a DG set for backup source. Color-coded bins will be placed at the construction site to segregate the waste at source and municipal waste will be managed accordingly in coordination with municipality. 					
1.2	Workers occupational health and safety	<ul style="list-style-type: none"> Conducted daily/weekly toolbox talks and uses visual signage to ensure continuous worker education on safety risks. There will have mandates full personal protective equipment for all staff and visitors, supported by on-site first aid at worksites and camps. 	GFT	During Construction	Contractor	Provisioned in provisional sum	NOC

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility	Approximate Budget (Rs.)	Monitoring and Evaluation
		<ul style="list-style-type: none"> The construction activities will be according to the Occupational Health and Safety (OHS) standards. 					
1.3	Increase in traffic volume Potential increase in road traffic incidents	<ul style="list-style-type: none"> Mobilization of project associated vehicles during off peak period. The construction related vehicles won't be parked on the road side. Ensured maintenance of access road of any damage caused by project. Visible warning signs on roads and terminal shall be installed. 	GFT	During Construction	Contractor	Provisioned in provisional sum	NOC
2.	Operation Phase						
2.1	Community Health and Safety	<ul style="list-style-type: none"> The fuel tanker won't be parked on the roadside. Green area and buffer zone will be maintained inside terminal and perimeter. All the products produced within the terminal will treated on site before discharged. 	GFT and surrounding Community	During Operation	NOC	Provisioned in provisional sum	NOC

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility	Approximate Budget (Rs.)	Monitoring and Evaluation
		<ul style="list-style-type: none"> A Community Feedback/Grievance Box will be established, allowing neighbors to report concerns regarding noise, dust, or driver behavior for immediate resolution. 					
2.2	Occupational Health and Safety	<ul style="list-style-type: none"> Hazardous Zone Classification: The terminal will be mapped into zones (Zone 0, 1, and 2) based on the risk. A mandatory PPE policy will be enforced. 	GFT and surrounding Community	During Operation	Contractor/ NOC	Provisioned in provisional sum	NOC
2.3	Fire safety and prevention	<ul style="list-style-type: none"> Vapor Recovery Units (VRU) will be installed to capture flammable gases during loading, reducing the risk of an explosive atmosphere. A fire hydrant system with dedicated, high-capacity two water tank of capacity 3719.64 KL of each will be maintained on Terminal. 	GFT and surrounding Community	During Operation	Contractor/ NOC	Included in project cost	NOC

S.N.	Environmental Impacts	Actions for Impact Mitigation	Place for Implementation	Time of Action	Responsibility	Approximate Budget (Rs.)	Monitoring and Evaluation
		<ul style="list-style-type: none"> • Dry Chemical Powder (DCP) and CO₂ extinguishers will be placed in all operational areas. • A dedicated Foam Tender fire extinguisher vehicle will be on stand. 					

8.4 Summary of Estimated Costs

Cost estimation for the proposed mitigation measures and enhancement measures on physical, biological and socio-economic and cultural environment of Siliguri Jhapa Petroleum Pipeline and Green Field Terminal is given in the Table 8-VI .

Table 8-VI: Environmental Impact Enhancement and Mitigation cost of SJPL Project

S.N.	Category / Item Description	Amount (NRs.)	Remark / Status
A	Capacity Building		
1	Training (Tool Box talks, Environment officers)	280,000.00	Provisioned in provisional sum
B	Physical Environment		
1	Traffic management provisions for construction sites	—	Responsibility of the Contractor
2	Excess spoil materials (safe disposal) management	—	Reuse of excavated materials
3	Slope protection work	850,000.00	Provisioned in provisional sum
4	Air and Noise Quality monitoring	540,000.00	Provisioned in provisional sum
5	Water quality monitoring	180,000.00	Provisioned in provisional sum
6	Water sprinkling to reduce dust	280,000.00	Provisioned in day works
7	Drainage management work at Greenfield Terminal	—	Included in Terminal Development work
8	Camp establishment	825,000.00	Included in project cost
9	Supply of Protective gears (PPEs), First aid facilities	455,000.00	Included in project cost
	Sub-total	3,130,000.00	
C	Biological Environment		
1	Wildlife fencing, warning signs, speed limits	250,000.00	Included in project cost
2	Physical & Biological enhancement (Plantation, noise barriers, etc.)	350,000.00	Provisioned in provisional sum
	Sub-total	600,000.00	
D	Socio-economic and Cultural Environment		
1	Relocation of public utilities (Water, Irrigation)	475,000.00	Provisioned in provisional sum
2	Pipeline Integrity & Safety Awareness for local communities	320000.00	Community safety near RoW
	Sub-total	795,000.00	
	Total Costs	4,205,000.00	

The estimated cost of implementing Environment impact enhancement and mitigation is NPR. 4,205,000.

8.5 Working Procedure on India Nepal Border

The pipeline cross India-Nepal Border at Mechi River Bridge near Kakarbhitta. In the borderland the pipeline will be laid by adopting HDD technology. The working activities on the borderland will be in supervision, coordination and support from the District Administration Office, Jhapa and corresponding of India.

8.6 Social Action Plan

A Social Action Plan is a very vital component of the EMP. It normally provides the institutional arrangements and processes of addressing the social issues so as to minimize the adverse impacts. Any development work leaves behind both positive as well as negative consequences to the nature and the society. All large projects need have in place a 'Social Action Plan' to deal with the possible ill impacts of the project on the society and also to facilitate the works of the project by having a sound relation with the surrounding community. The project shall also collect the public grievances and timely put up to the higher concerned authority before the situation worsens. The respective Municipality and District Administration Office (DAO) normally coordinate inter- agency activities.

8.7 Occupational Health and Safety Management Plan

OHS risks during the construction of the pipeline and the green field terminal will be managed through integrated engineering controls and administrative protocols. The project will mandate shoring and benching for all trenches exceeding 1.5 meters and will conduct comprehensive utility mapping to prevent strikes. High-risk tasks, including welding and radiography, will be strictly regulated under a Work Permit System (OISD-STD-105), featuring cordoned-off zones and TLD badge monitoring. Furthermore, site-specific safety inductions and mandatory PPE-including helmets, high-visibility vests, and steel-toed boots-will be enforced for all personnel to ensure a zero-accident construction environment.

During the operational phase, mitigation strategies will focus on preventing hydrocarbon releases and managing high-energy risks associated with storage. The facility layout will strictly adhere to OISD-STD-118 safety distances to eliminate domino effects between the tanks. Static electricity during fuel transfer will be controlled via mandatory earthing and bonding systems (OISD-RP-110) and the use of antistatic additives. Pipeline integrity will be sustained through continuous Cathodic Protection monitoring (OISD-STD-188) and a SCADA-based leak detection system (API 1130) capable of triggering Remote Operated Shut-off Valves. Fire safety will be ensured by a 4-hour water reserve and fixed foam systems, while health risks from VOC exposure will be managed through Vapor Recovery Systems and mandatory health surveillance per OISD-GDN-166.

The project will establish a "Health & Safety Management Committee" comprising project officials, local government, health facilities, and security personnel to mitigate negative consequences on worker and public health. A formal grievance mechanism to receive, study, and address health-related complaints from the surrounding community and workforce will

be formulated. Through this collaborative structure, the project authorities will ensure that necessary steps are taken to abate health hazards and uphold the safety of both the project environment and the local population.

8.8 Handling and Storage of Hazardous Chemical

The hazardous substances used during the construction period includes petroleum oil products, welding gases, etc. All these hazardous substances will be handled and stored in strict compliance with the requirements of Ministry of Forests and Environment. Any spills/leaks from the pipe onto land will be immediately remediated to minimize the potential of soil and groundwater contamination. Attention will be given to prevent to mixing of hazardous waste with non-hazardous waste. Suitable Personal Protective Equipments (PPE) will be used by workers while handling hazardous wastes. The Environment Unit will instruct the contractor and the DSC of the same and ask the contractor to comply with immediate effect.

8.9 Permits and Approval Plan

The administration of the project office shall be dealing with such issues like; obtaining permits and getting approval of plans from the relevant authorities.

8.10 Demobilization and Rehabilitation Management Plan

The project after completion of the construction activities shall reinstate the temporarily occupied spaces used for worker's camp, construction material preparation/processing sites, sheds, warehouses, quarry sites, borrow pits etc. Site clearance activity shall be carried out by the contractor to bring back the outlook of the used spaces to original form. Removal of construction wastes and debris, filling, protection work if required etc. shall be the possible activities to be done by the contractor. The EMU will be overseeing the activities for their appropriateness and compliance to this plan as well.

8.11 Environmental Management Unit

The proponent needs to have an Environmental Management Unit (EMU) within the project office. The proposed organogram with key staffs for the Environmental Management Unit is presented below.

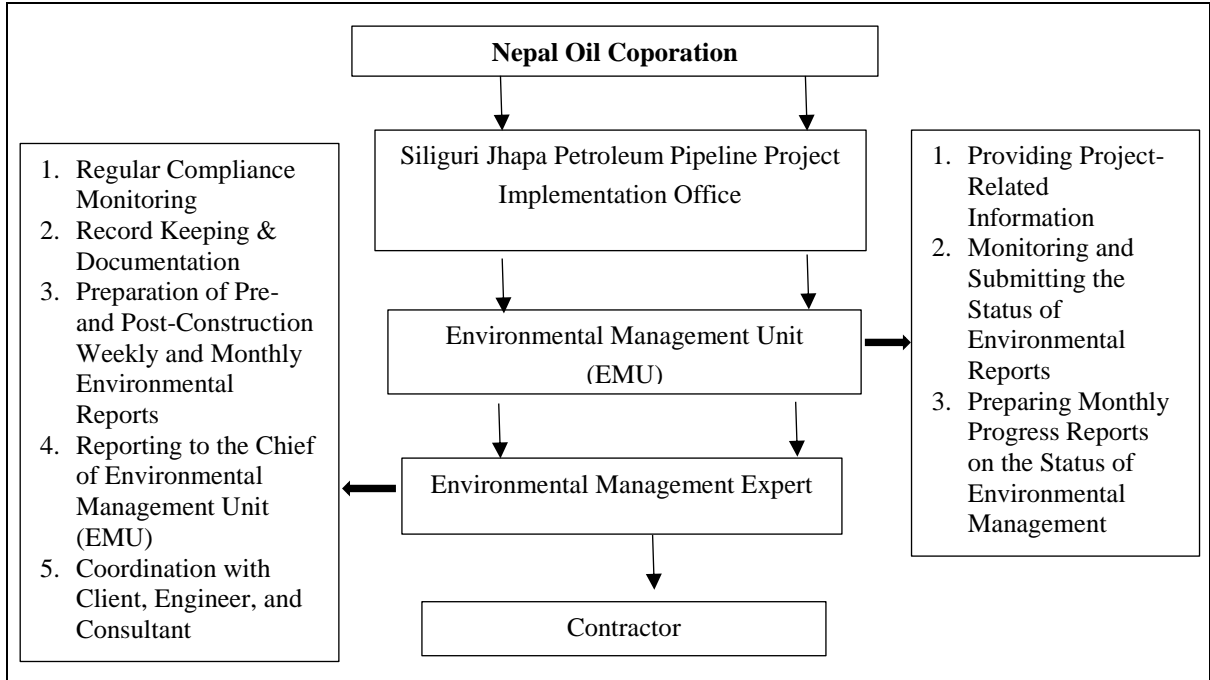


Figure 8-I Environment Management Unit

8.12 Reporting Requirements

The Environmental monitoring reports prepared by the EMU shall be made available to the project authority at the field each month. Nepal Oil Corporation shall be responsible for sending compiled half-yearly report to the Ministry of Forests and Environment. The Ministry of Forests and Environment can anytime visit the site to validate the report.

CHAPTER 9: ENVIRONMENTAL MONITORING

Environmental Monitoring is an integral part of the Environmental Management Plan. It also assists to ensure compliance with environmental laws and in ameliorating or eliminating adverse impacts.

As per the provision made in Rule 45 (1 and 2) of EPR 2077, the UAHEP is responsible for the monitoring of the environmental impacts of the project implementation every six months and submit the monitoring report to the concerned agencies. In addition to that, as per the provision made in Article 39(1) of EPR -2077, Ministry of Forests and Environment (MoFE), and Department of Environment also monitor the implementation of EIA report made under the act. In order to implement the effectiveness of mitigation measures, it is essential to conduct three types of environmental monitoring for petroleum pipeline and storage terminal project which is as follows:

9.1 Types of Monitoring

The Environmental Monitoring Plan incorporates three specific types of monitoring: Baseline Monitoring, Compliance Monitoring, and Impact Monitoring. The environmental impact monitoring shall be conducted as follows:

9.1.1 Baseline Monitoring

Impact monitoring on the physical, biological and socio-economic and cultural parameters will be conducted in order to detect environmental changes that occur as a result of project implementation. It involves actual measurement of the impacts of construction activities on the environment, such as air noise and water quality samples being taken at regular intervals to assess pollution concentrations. Impact monitoring is scientific data collection, analysis interpretation and follow-up of mitigation measures. It is designed to assess actual impact vs. predicted impact and the effectiveness of the mitigation measures.

9.1.2 Impact Monitoring

Impact monitoring on the physical, biological and socio-economic and cultural parameters will be conducted in order to detect environmental changes that occur as a result of project implementation. It involves actual measurement of the impacts of construction activities on the environment, such as air noise and water quality samples being taken at regular intervals to assess pollution concentrations. Impact monitoring is scientific data collection, analysis interpretation and follow-up of mitigation measures. It is designed to assess actual impact vs. predicted impact and the effectiveness of the mitigation measures.

9.1.3 Compliance Monitoring

Compliance Monitoring provide a continuous recording of specific environmental quality indicators or pollution levels in order to ensure project compliance with recommended

government environmental protection standards. Compliance covers the work to be done by the proponent and contractor. Basically, compliance monitoring would be carried out at site. This monitoring will be conducted during project construction as well as operation phase.

9.2 Environmental Monitoring Indicators

The report identifies specific indicators to monitor the effectiveness of environmental protection measures and to track both positive and negative impacts. These indicators are established based on baseline data, impact identification, and the proposed mitigation strategies that the proponent is required to implement.

9.3 Monitoring Methodology

Monitoring will utilize field observations, project data, and stakeholder consultations. To ensure technical compliance, physical samples of air, noise, and water will be collected and analyzed in certified laboratories. This process requires active coordination between the project office, the proponent, and local government units (Ward/Municipality).

9.4 Monitoring Schedule

A detailed timeline will be established for the construction and operational phases. Monitoring frequency for each environmental indicator will be determined by its specific nature and potential impact level.

Table 9-I: Monitoring Plans and Schedule

Aspects	Parameters	Indicators	Method	Schedule	Monitoring Agency	Location
A. Baseline Monitoring						
Physical Environment	Air Quality	TSPM, PM ₁₀ , PM _{2.5} , Lead, SO ₂ , NO _x Benzene, Ozone, CO%	As per NAAQS, Nepal	Before Construction	Project/Local level/ MoFE/DoE	Along pipeline and Terminal
	Noise Level	Lmax, Lmin, Leq, L ₅ , L ₁₀ , L ₅₀ , L ₉₀ , L ₉₅	As per NNQS standards	Before Construction	Project/Local level/ MoFE/DoE	along pipeline
	Water Quality	BOD, Turbidity, E-Coli, TSS, Oil and Grease and as per NDWQS parameters	As per NDWQS standards	Before Construction	Project/Local level/ MoFE/DoE	At water sources along the pipeline and terminal area
Biological Environment	Forest status in terms of species present	Tree species present	Quadrat sampling/total enumeration	Before construction	Project/Local level/ MoFE/DoE	Charali Forest
	Wildlife and Wildlife species	Wildlife in terms of species present/reported, Protected species	FGD, consultation with local, Jhapa forest offices and CFUGs,	Before construction	Project/Local level/ MoFE/DoE	Charali Forest and vicinity area
	Aquatic fauna	Presence of fish species and aquatic life	Cast net sampling,	Before construction	Project/Local level/ MoFE/DoE	At water sources along the pipeline
Socioeconomic and Cultural Environment	Settlement/ infrastructure	Increase in settlements, infrastructure, migration	Discussion with local people, observation	Before construction	Project/ MoFE/DoE	
	Socio-economic/ cultural baseline	Update socio-economic/ cultural baseline	Discussion with local people, observation, review		Project/Local level/ MoFE/DoE	
B. Impact Monitoring						

Aspects	Parameters	Indicators	Method	Schedule	Monitoring Agency	Location
B.1 Construction Phase						
Physical Environment	Air Quality	TSPM, PM ₁₀ , PM _{2.5} , Lead, SO ₂ , NO _x Benzene, Ozone, CO%	Inspect & confirm related safeguard clauses are adequately stated in Contractor's Contract Document Site inspection to inspect Contractor's construction practice	Twice a year (dry and wet season)	Project/Local level/ MoFE/DoE	Near settlement (Kakarbhitta, Dhulabari, Charali and) Terminal area
	Noise Quality	As per NNQS standards	Interview local residents on air, noise and vibration effects at their locality during construction period	Twice a year (dry and wet season)	Project/Local level/ MoFE/DoE	Near settlement along pipeline Terminal area
	Water Quality	as per NDWQS parameters	Water quality measurements construction practice Interview local residents on water effects at their locality during construction period	Twice a year (dry and wet season)	Project/Local level/ MoFE/DoE	At water source sites
	Spoil and Construction Waste Management	Location, siltation, erosion, spoil management	Inspect spoil disposal plan made by Contractor Interview local people about nuisance caused by spoil disposal	Weekly	Contractor/NOC	Muck and Spoil Disposal Area

Aspects	Parameters	Indicators	Method	Schedule	Monitoring Agency	Location
	Labour Camp Management	Proper arrangement of food stalls, camp sanitation and water supply facilities, solid waste management	Site Observation, discussion with workers	Monthly	Project/Local level/NOC	Labour Camp area
	Timely rehabilitation of infrastructure	Site Condition	Site Observation, discussion with local people	After Construction	Project/Local level/ MoFE/MoICS/NOC /DoE	Throughout the petroleum pipeline alignment
Biological Environment	Possible disturbance to wildlife	Number and species of wild animal reported	Verify that all necessary regulations have been adopted	Construction stage, at least twice yearly	NOC, CFUG	
	Pressure on forests for fuel wood in labor camps	Recorded of illegal activities, accidental leakage in the project area, use of fuel source in camp site	Verify number of labours residing in each camp and the physical facilities including fuel used in the camp by the Contractor Interview local residents about labours behaviours	During construction period, at least twice yearly	Project, CFUG	
Socioeconomic and Cultural Environment	Public Health	Types of disease and incidence of disease in the project workers and local community	Meeting and discussion with local health posts and district hospitals	Quarterly	Project/Local level/ MoFE/DoE	Project affected RMs/Municipality, Labour Camp
	Social and Cultural Practices	Likely disturbance in traditional cultural ways	Observation and discussion	Quarterly	Project/Local level/ MoFE/DoE	Project affected RMs/Municipality

Aspects	Parameters	Indicators	Method	Schedule	Monitoring Agency	Location
	Local employment opportunity	Number of employment, increase in income, payment of wages to workers on time	Inspect & confirm labour related clauses are adequately stated in, Contractor's contract Document , Site inspection & labour interview, Verify with contractors payroll	Quarterly	Project/Local level/ NOC	Project affected area
B.2 Operation Phase						
Physical Environment	Surface flow interruption	Cross drainage and side drain damaged or blocked	Field visit, discussion with local people	Once a year	Project/Local level/ MoFE/DoE	Throughout the petroleum pipeline alignment
	Improved Transportation Facility and reliable supply of petroleum products	Pipeline integrity	Inspect Project's construction design and plans	Periodically during operation (usually Monthly)	NOC	pipeline alignment and terminal
	Improvement in environmental quality	Records of leakage, regular maintenance of pipeline	Inspect corrosion, leaks periodically and recommend for reconstruction if damage is found	Periodically during operation (Monthly) or as per requirement	NOC	pipeline alignment and terminal
	Waste from pigging	Testing procedure, Concentration of pigment products	Inspect pigging structure at montly time interval	During operation stage	NOC	
	Fuel and lubrcant spills	Leaks in pipes, installation of warning signals,	Inspect leakage at monthly time interval	During operation stage	NOC	

Aspects	Parameters	Indicators	Method	Schedule	Monitoring Agency	Location
	due to the accidental leaks	combustible materials around the project area				
Biological Environment	Hunting and poaching of wildlife and fish catch	Record of animal hunting	FGD	Once a six month	Project/Local level/ MoFE/DoE	
	Disturbances to aquatic fauna	Number of fish catch, fish type available	FGD	Once in six month	Project/Local level/ MoFE/DoE	
Socioeconomic and Cultural Environment	Local employment	Priority for the local employment	Cross checking the list of employment	Annual	Project/Local level/ MoFE/DoE	Project site
	Economic status	Changes in economic condition of local people due to withdrawal of economic opportunity	Interview and discussion	Annual	Project/Local level/ MoFE/DoE	PAFs
C. Compliance Monitoring						
C.1 Construction Phase						
Physical Environment	Air Quality	TSPM, PM10, PM2.5, Lead, SO2, NOx Benzene, Ozone, CO%	As per National Ambient Air Quality Standards, Nepal	Twice a year (dry and wet season)	Project/Local level/ MoFE/DoE	Near settlement along pipeline
	Water Quality	BOD, Turbidity, E-Coli, TSS, Oil and Grease and as per NDWQS parameters	As per NDWQS standards	Twice a year (dry and wet season)	Project/Local level/ MoFE/DoE	At water source site
	Noise Quality	Lmax, Lmin, Leq, L5, L10, L50, L90, L95	As per NNQS standards	Twice a year (dry and wet season)	Project/Local level/ MoFE/DoE	Along pipeline
Biological Environment	Increase demand of fuel	Fuel used by labor	Visual inspection and enquiry to labor	Once a month	Project/Local level/ MoFE/DoE	Project labor camp
	Hunting and poaching	Involvement of labor force	Meeting and interaction	Once a month	Project/Local level/ MoFE/DoE	Project impact area

Aspects	Parameters	Indicators	Method	Schedule	Monitoring Agency	Location
	NTFPs exploitation	a) NTFPs collection status and type of involvement b) NTFPs collection and management plan	Community meeting and visual inspection	Once a month	Project/Local level/ CF/DFO, Jhapa	Project impact area
Socioeconomic and Cultural Environment	Fire Hazard	a) Fire on labor camp and other project facilities b) Awareness and training to workforce c) Provision of fire fighting	Community meeting and record inspection	Once a month	Project/Local level/ MoFE/DoE	Project impact area
	Health and safety	Availability of first Aid	Observation and record review	Periodic as per construction schedule	Project/Local level/ MoFE/DoE	Project site
	Occupational safety	Danger signal in the construction site, Use of personal protective equipment by the workers, Number of trainings for the workers, Health check up records Adequacy of occupational safety measures (helmets, boots, warning signs etc.)	Inspect records kept by Contractor Inspect use of safety gears by workers at site Interview site workers on the provisions made	Periodic as per construction schedule	Project/Local level/ MoFE/DoE	Project site
	Issues related to road safety and traffic	Condition of trenches, restoration of excavated surface, speed limit in the construction site	Inspect and confirm road safety related clauses are adequately stated in Contractor's Contract Document Interview local resident's on any	Regular	Project/DoR	along the pipeline route

Aspects	Parameters	Indicators	Method	Schedule	Monitoring Agency	Location
			effect caused by construction work			

9.4 Institutional Framework for Monitoring

Environmental responsibility is shared among all construction entities, with specific duties assigned to each. Under Section 39 of the Environment Protection Act, 2076, the Ministry of Forests and Environment and the Department of Environment are the primary oversight bodies. Provincial and local governments also hold inspection authority.

Per Rule 45 of the Environment Protection Rules, 2077 (2019), the proponent is legally mandated to conduct self-monitoring every six months and submit the findings to the relevant department.

The stakeholders involved in ensuring environmental and social safeguards during the construction and operation phases of the proposed project are presented in the following Table 9-II.

Table 9-II: Monitoring agencies and their responsibilities

S.N.	Monitoring Agency / Stakeholder	Role	Key Responsibilities	Remark
1.	Ministry of Physical Infrastructure and Transport (MoPIT)	Use of Highway's ROW	The Ministry responsible for providing the RoW for Petroleum pipeline use.	
2.	Ministry of Forests and Environment (MoFE)	Competent Regulatory Authority	Final approval of EIA Reports; overseeing regulatory compliance with the Environment Protection Act (2019), monitoring to ensure adherence to approved measures.	
3.	Ministry of Industry, Commerce and Supplies (MoICS)	Parent Ministry of the Proponent	Reviewing and endorsing EIA reports for submission to MoFE, supervisory role including periodic monitoring of project implementation.	
4.	Department of Roads (DoR)	Technical Support	Providing technical advice, reviewing schedules and environmental reports for road-related infrastructure.	
5.	NOC's Project Implementation Unit (PIU)	Project Proponent's Executing Body	Preparing/implementing EIA and EMP, integrating EMP into bidding documents, operating the Grievance Redress Mechanism (GRM), overseeing OHS personnel.	
6.	Supervision Consultant (SC)	Technical Supervision & Compliance	Supervising contractor compliance; conducting site inspections; identifying non-compliances, preparing monthly/quarterly monitoring reports for the PIU.	
7.	Contractor	Primary Field Implementation	Preparing the Contractor's ESMP (CESMP), obtaining permits/statutory	

			approvals, ensuring subcontractor compliance, deploying site OHS Officers.	
8.	Local Government	Local Coordination	Facilitating a conducive environment for construction; local-level monitoring and coordination with the proponent.	

9.5 Grievance Redress Mechanism

During the construction and operation phases of the project, residents of the directly affected areas and stakeholders may file legitimate grievances or register complaints regarding the environmental impacts caused by the project. The Grievance Redress Mechanism will listen to the grievances, identify the causes, and address them effectively.

A grievance redress mechanism (GRM) will be established to receive, evaluate, and facilitate the resolution of affected people's concerns, complaints, and grievances about the social and environmental performance of the project. These issues will be addressed through acknowledgement, evaluation and corrective action and response approach. The GRM aims to provide a trusted way to voice and resolve concerns linked to the project, and to be an effective way to address affected people's concerns.

Tier 1-First Level GRM-Site Specific

The Contractor and Supervision Consultant (SC) serve as the first and most accessible points for grievance resolution. Prior to construction, the Project Implementation Unit (PIU) shall hold community meetings to notify residents and provide the Site Project Office's contact details.

A designated Safeguards Focal Person at the Site Project Office shall receive and document all complaints, including the complainant's name, date, and nature of grievance, location, and resolution status. This focal person shall collaborate with the contractor and SC specialists to resolve issues within 1–2 days. All grievances, whether resolved or pending, must be immediately reported to the central PIU for official documentation and oversight.

Tier 2- Project level

The Second Level of the GRM is activated if a complaint remains unresolved at the site office, requiring the grievance to be forwarded to the Project Director (PD) within the PIU. The PD/PIU is responsible for direct engagement with affected persons to resolve environmental or social concerns.

To ensure timely resolution, the PD/PIU shall implement corrective measures within 7 days. Comprehensive documentation is mandatory for each case, including the complainant's details, the nature of the grievance, the location, and the final resolution achieved.

Tier 3- Department Level

The third Level of the GRM is activated by the Project Director (PD/PIU) if a grievance remains unresolved at the project level. This involves referring the case to a formal Grievance Redress Committee (GRC) established by MoICS/NOC.

The GRC will review documentation and consult with the PIU, Site Office, and affected persons to determine corrective actions. To ensure high-level accountability, the committee is mandated to assign clear implementation responsibilities and resolve the matter within 15 days.

Tier 4- Court of Law

If the internal mechanism-including the Contractor, Site Office, PIU, or Ministry fails to provide a satisfactory resolution, the affected person reserves the right to seek legal redress through the judicial system.

Critically, the existence of this GRM is inclusive and does not prevent affected persons from seeking legal recourse at any stage of the project lifecycle. This ensures that the project remains accountable to national laws while providing an accessible path for justice if administrative solutions are exhausted.

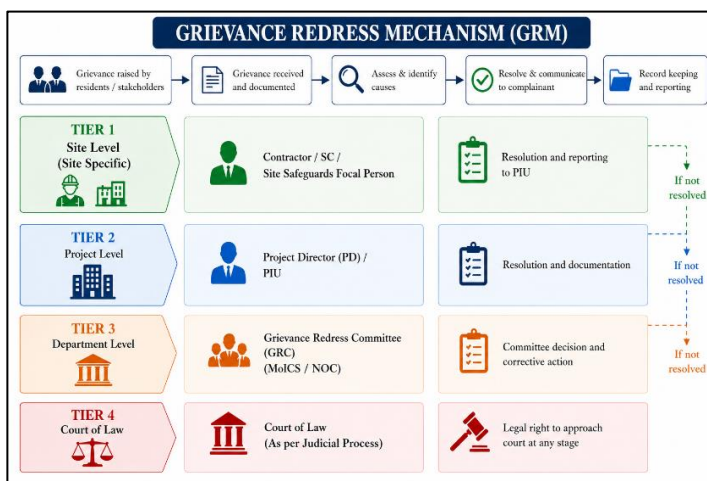


Figure 9-I: Grievance redress mechanism of project

9.6 Estimated Cost for Environmental Monitoring

The estimated budget for the environmental monitoring is mentioned below;

Table 9-III: Estimated cost for environmental monitoring

Description	Quantity	Rate (NRs.)	Amount (NRs.)	Remark
Environmental Specialist	4	80000	320000	
Forestry expert/Biologist	4	80000	320000	
Sociologist	4	80000	320000	
Reporting, Logistics, etc.			100000	
Transportation	LS		100000	
Field samling and lab test (air and water quality, noise level)	LS		300000	
Monitoring cost by government instution and third party	LS		200000	
Total cost for environmental monitoring works			16,60000	

CHAPTER 10: ENVIRONMENTAL AUDITING

10.1 Objective of Environmental Auditing

Environmental impact auditing assesses the actual environmental impact, effectiveness of environmental impact mitigation, and enhancement measures and functioning of monitoring mechanisms. The primary objective of environmental auditing, as mandated by the Environmental Protection Act, 2019 A.D. of Nepal, is to systematically evaluate the environmental performance of a project during and after its implementation. Environmental auditing ensures that approved environmental commitments are fulfilled and that adverse impacts are properly identified, managed, and documented.

10.2 Auditing Parameters, Methods and Indicators

The Ministry of Forests and Environment (MoFE) may consider the environmental protection measures and monitoring parameters as the basis of EIA/EMP for auditing. MoFE, as a responsible agency for audit, may hire a team of experts to prepare the audit report. The audit plan including parameters, methods, and indicators will be following.

Table 10-I: Environment audit parameters

S.N.	Parameters	Location	Methods	Indicators
A. Physical and Chemical Aspect				
1.	Air Quality (PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , CO)	Project site, nearby settlements	Ambient air monitoring, review of records	Concentration levels within national standards
2.	Noise Level	Construction areas, sensitive receptors	Sound level measurement	dB(A) values within permissible limits
3.	Solid Waste	Project facilities and camp	Site inspection, record review	Status of solid waste segregation and disposal
4.	Surface Water Quality	Rivers, streams, near project	Water sampling and laboratory analysis	pH, DO, BOD, COD, turbidity, grease and oil
5.	Groundwater Quality	Wells, tube wells in project area	Water quality testing	Drinking water quality standards
6.	Soil Quality	Near to the pipeline and green field terminal	Soil sampling and analysis	pH, organic matter, contamination level
B. Biological Aspect				
1.	Vegetation and Forest Cover	Project footprint and buffer zone	Field survey, satellite imagery	Area of vegetation loss/restoration

S.N.	Parameters	Location	Methods	Indicators
2.	Wildlife and Biodiversity	Forests, corridors, nearby habitats	Field observation, consultation	Presence of key species, habitat disturbance
C. Socio Economic and Cultural Environment				
1.	Livelihood and Employment	Around the project area	Household survey, interviews	Employment opportunities created
2.	Public Health and Safety	Project site and nearby settlements	Health records review, consultation	Incidence of accidents or illness
3.	Socio-economic Change	Project Area	Survey and interview	Change in local economy
4.	Affects on cultural and religious sites	Affected foot trail/steps, access road to cultural sited and other sited of worship as mentioned in EIA report	Observation and interview	Reinstate Foot trail/ steps access road, status and use of such sites, culture and religion of adjoining sites

10.3 Content of the Environmental Audit Report

The structure of the environmental audit report of the proposed project will be as follows:

Table 10-II: Contents of the Environmental Audit

Chapter	Description
Chapter 1	In this chapter, the executive summary of the report should be written including the main points of the environmental test report.
Chapter 2	In this chapter, details of test administration and test work, interviews conducted at the venue, testing parties and test areas and methods should be included. Also, the facts and details related to environmental monitoring and testing should also be included.
Chapter 3	This chapter should contain complete details of the test
Chapter 4	In this chapter, suggestions and corrective actions to be followed in relation to the project should be included.
Annexes	Facts and details should be included in the Annexes.
Human Resources to be included	During the preparation of the environmental test report, experts who match the subject with the proponent, such as environmental experts, social, economic, cultural experts, waste management experts, etc., should be included.

10.4 Estimated Environmental Audit Cost

In accordance with national environmental regulations, the entire financial burden for the engagement of experts, laboratory testing fees, equipment calibration, and the production of quarterly monitoring reports shall be borne solely by the Project Proponent (NOC). These costs shall be integrated into the project's annual environmental budget to ensure no interruptions in the monitoring cycle.

CHAPTER 11: CONCLUSION AND COMMITMENTS

11.1 Conclusion

The proposed Siliguri–Jhapa Petroleum Pipeline Project is a landmark cross-border energy infrastructure initiative between the Government of India and the Government of Nepal, implemented under a Government-to-Government (G2G) framework. The project involves the construction of a 49.6 km underground petroleum pipeline connecting the Indian Oil Corporation (IOC) Siliguri Terminal in India to the proposed Jhapa Terminal at Charali, Nepal, with 14.6 km of the alignment located within Nepalese territory. The pipeline is proposed to be laid in between 2-3 meter from encroached free RoW edge along the the East–West Highway, from Kakarbhitta to Charali, and same alignment of the Mechi Highway, from Charali to Duhagadi, thereby minimizing environmental disturbance. A Green Field Terminal with the capacity of 18,900 KL petroleum products mainly Motor Spirit (MS) and High-Speed Diesel (HSD) is proposed in the Duhaagadi, Charali, Jhapa on area of 23 Bigha 3 kattha 13 Dhur land owned by the NOC itself.

The Environmental Impact Assessment (EIA) indicates that the project will significantly enhance the efficiency, safety, and reliability of petroleum product transportation to eastern Nepal. The pipeline offers a sustainable alternative to road-based transportation by petroleum tankers, which currently poses challenges related to traffic congestion, accidents, fuel losses, emissions, and supply disruptions. Considering the increasing demand for petroleum products in Nepal, the project plays a crucial role in strengthening national energy security and supporting industrial and economic development in the region.

The assessment identifies that the RoW that will be used, has been cleared in underground and on surface, and the pipeline alignment does not pass through forest area. However, major environmental impacts are primarily associated with the construction phase, including trenching and excavation works, temporary disturbance to traffic, noise and dust generation, soil erosion, waste generation, and limited impacts on roadside vegetation and nearby settlements. The use of underground pipeline installation at a minimum depth of 1.2 m, vary depending upon the environmental sensitivity, adoption of Horizontal Directional Drilling (HDD) at sensitive locations such as road crossings and water bodies, and the integration of modern safety and monitoring systems substantially reduce potential environmental risk and safety concern.

During the operational phase, environmental impacts are expected to be minimal due to the enclosed nature of pipeline transport and the incorporation of advanced control systems, optical fiber–based monitoring, leak detection mechanisms, fire-fighting facilities, and security measures at the Jhapa Terminal. The proposed terminal infrastructure, with a total storage capacity of 18,900 KL for Motor Spirit (MS) and High-Speed Diesel (HSD), has been

designed in compliance with applicable safety and environmental standards and includes provisions for future expansion.

Overall, the EIA concludes that the benefits of the Siliguri–Jhapa Petroleum Pipeline Project significantly outweigh its potential adverse impacts. With effective implementation of the proposed Environmental Management Plan (EMP) and adherence to national environmental laws and standards, the project will have limited and manageable environmental impacts and will be highly beneficial to the country. Therefore, the EIA recommends the implementation of the project with the prescribed mitigation, monitoring, and management measures.

11.2 Commitments

The project commits to the following conditions to make project environmental friendly, socially inclusion, and sustainable;

- NOC shall strictly implement all mitigation and monitoring measures defined in the EMP across all project phases.
- Trenchless technology (Horizontal Directional Drilling - HDD) will be utilized at all water bodies, road crossings, and congested areas to prevent surface disturbance.
- Disturbed land will be restored to its original state immediately after construction.
- A comprehensive Oil Spill Prevention and Emergency Response Plan-including a disaster management framework-shall be established and enforced.
- Monitoring of air, noise, soil, and water will be conducted, alongside mandatory environmental auditing per the Environment Protection Act, 2019 and its Rule, 2020.
- Stringent Occupational Health and Safety (OHS) protocols, traffic management, and community awareness programs shall be maintained in all settlement areas.
- NOC commits to continuous coordination with concern stakeholders, local authorities and the timely submission of monitoring reports to the Ministry of Forests and Environment.

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Mechinagar Municipality, Office of The Municipal Executive | Koshi Province, Government of Nepal

National Statistics Office

www.floraofnepal.org/countryinformation/listedplants/national

ANNEX

Annex I: Public Hearing Notice

Annex II: 7-Day Public Notice

गरको छ। साफाद्वारा पकिस्तानको इस्लामाबादमा गत बिहीवार आयोजित एक कार्यक्रममा उक्त पुरस्कार बैंकका प्रमुख कार्यकारी अधिकृत गोविन्द गुरुडले ग्रहण गरेका हुन्।

पुरस्कार प्राप्तपश्चात् बैंकका वस्तु तथा सेवा सुविधा सन्दर्भमा पारदर्शिता, उत्कृष्टता र सुदृढ सुशासन प्रतिको बैंकको निरन्तर प्रतिबद्धतालाई झल्काउने बैंकको भनाइ छ। साथै, यसले बैंकलाई

उत्कृष्टतातर्फ निरन्तर प्रयास गर्न र सरोकारवालाका लागि विश्वसनीय, गुणस्तर-उन्मुख वित्तीय रिपोर्टिङ प्रदान गर्न उत्प्रेरित गरेको बैंकले जानकारी दिएको छ।

सिलिगुरी-भापा पेट्रोलियम पाइपलाइन (नेपाल खण्ड-१४.६ कि.मि.) तथा चारआली ग्रिन फिल्ड टर्मिनल आयोजनाको वातावरणीय प्रभाव मूल्यांकन प्रतिवेदन तयारी सम्बन्धी सार्वजनिक सूचना

प्रकाशित मिति: २०८२/०८/१५

कोशी प्रदेश, भापा जिल्ला, मेचीनगर नगरपालिकामा नेपाल आयल निगमद्वारा निम्न बमोजिमको प्रस्ताव कार्यान्वयन गर्न लागिएको छ।

प्रस्तावकको नाम र ठेगाना	नेपाल आयल निगम लिमिटेड इन्जिनियरिङ, परियोजना तथा सूचना प्रविधि विभाग, बबरमहल, काठमाडौं ईमेल: engg@noc.org.np फोन नं: १-५३६४९७५, १-५३६४९७४, १-५३५९५४८
प्रस्तावको व्यहोरा	कोशी प्रदेश, भापा जिल्ला, मेचीनगर नगरपालिकामा भापाको मेची पूल नजिक नेपाल भारत सिमाना देखी चारआली चोक सम्म पूर्व-पश्चिम राजमार्गको क्षेत्राधिकार (ROW) तथा चार आली चोक देखि प्रस्तावित ग्रिन फिल्ड टर्मिनल सम्म मेची राजमार्गको क्षेत्राधिकार भित्र करिब १४.६ कि.मि. लम्बाईमा ८ इन्च व्यास भएको भूमिगत पेट्रोलियम पाइपलाइन विस्तार तथा भापा चारआलीमा १८,९०० किलो लिटर पेट्रोलियम पदार्थ भण्डारण क्षमताको ग्रिन फिल्ड टर्मिनल निर्माण गर्ने।
प्रभाव पर्न सक्ने न.पा. तथा वडाहरू	मेचीनगर नगरपालिकामा वडा नं ६,७,८,१०,१३,१४

माथि उल्लिखित प्रस्तावको वातावरणीय प्रभाव मूल्यांकन प्रतिवेदन तयारी गर्ने क्रममा सो क्षेत्रको प्राकृतिक भौतिक प्रणाली, जैविक प्रणाली, सामाजिक प्रणाली, साँस्कृतिक प्रणाली र आर्थिक प्रणालीमा के कस्तो प्रभाव पर्दछ भनी यकिन गर्न प्रस्ताव कार्यान्वयन हुने नगरपालिका तथा त्यस क्षेत्रका विद्यालय, स्वास्थ्य चौकी, सामुदायिक वन तथा सरोकारवाला व्यक्ति वा संस्थाको लिखित राय सुभाव लिन आवश्यक भएकाले यो सार्वजनिक सूचना प्रकाशन भएको मितिले सातदिन भित्र निम्न ठेगानामा आई पुग्ने गरी लिखित राय सुभाव उपलब्ध गराई दिन हुन अनुरोध गरिन्छ।

राय सुभावको लागि पत्राचार गर्ने ठेगाना:

प्रस्तावकको नाम र ठेगाना	नेपाल आयल निगम लिमिटेड इन्जिनियरिङ, परियोजना तथा सूचना प्रविधि विभाग, बबरमहल, काठमाडौं ईमेल: engg@noc.org.np फोन नं: १-५३६४९७५, १-५३६४९७४, १-५३५९५४८
परामर्शदाताको नाम र ठेगाना	रेडनट इन्जिनियरीङ कन्सल्टेन्ट प्रा. लि. बाग्मती प्रदेश, काठमाण्डौ जिल्ला, काठमाण्डौ महानगरपालिका-३ ईमेल: redknot.eng@gmail.com

बोर्डरल्यान्ड

वर्षा नं. १६००८९०१५२६

असीमित सूचना र विश्लेषणका लागि

पूर्वको राष्ट्रिय दैनिक

BORDERLAND DAILY

बर्ष २ अंक २५ वि.सं. २०८२ मंसिर १६ गते मंगलबार BORDERLAND DAILY, 2 DEC. 2025, Tuesday पृष्ठ ४ मूल्य रु ५०-

भन्सार, राजस्व अनुसन्धान

र सशस्त्र

भापा । राजस्व संकलन र अनुसन्धान गर्ने सरकारी निकायसँग सुरक्षा फोर्सको मनमुटाव हुँदा कोशी प्रदेशमा तस्करीले प्रसव पाएको छ । विराटनगर भन्सार र राजस्व अनुसन्धान इकाई कार्यालय इटहरीसँग चोरी तस्करी नियन्त्रण गरी राजस्व असुलीमा सहयोग गर्ने सशस्त्र प्रहरीबीच मनमुटाव हुँदा पूर्वमा तस्करी मौलाएको हो ।



राजस्व संकलनका मुख्य कार्यालय भन्सार र राजस्व अनुसन्धान तथा सीमा सुरक्षा अनि तस्करी नियन्त्रणका लागि सीमा क्षेत्रमा खटिएको सुरक्षा निकायबीच एकले अर्कोलाई हिलो छुट्याउने पुरानो चलन भए तापनि अहिले भने यी तीन निकायबीचको असन्तुष्टि सतहमा आएको हो ।

बाहिनी पकली सुनसरी राजस्वसँग सम्बन्धित ती सरोकारवाला कार्यालय विर माथिल्लो निकायसम्बन्धित उजुरी नै गरेपछि यी त्रि निकायबीचको असन्तुष्टि छत्तापुल भएको हो ।

यसै क्रममा तस्करी नियन्त्रणमा सशस्त्रले सक्रियता देखाए पनि भन्सार र राजस्व अनुसन्धान निकायका कर्मचारी तस्करीसँग मिलेमतोमा रहेको तथा भन्सार छलीका घटनामा पक्राउ परेकालाई न्यून घरीटीमा छाडे र वित्तुभन्दा कारवाही नभएको भन्दै सशस्त्र प्रहरी बल बराह बाहिनी पकली सुनसरी रुष्ट बनेको छ । त्यति मात्र नभई भन्सार जीवघास प्रक्रिया र राजस्व अनुसन्धान कार्यालय इटहरीको काम कारवाही वित्तुभन्दा नभएको र तस्करी नियन्त्रणमा सरोकारवाला ती दुई कार्यालयले सहयोग नगरेको भन्दै सशस्त्र प्रहरी बल बराह

सीमा सुरक्षा र राजस्वसँग सम्बन्धित प्रभावकारी काम गरेर विराटनगर भन्सार र राजस्व अनुसन्धान कार्यालय इटहरीको काम-कारवाही सन्तोषजनक नरहेको अहिलेको स्थितिमा चोरी-तस्करी नियन्त्रण गरेर राजस्व संकलन बढाउन सक्ने स्थिति नभए उल्लेख गर्दै सशस्त्र प्रहरी बराह बाहिनी पकली सुनसरी मात्र नभई भन्सार जीवघास प्रक्रिया र राजस्व अनुसन्धान कार्यालय इटहरीको काम कारवाही वित्तुभन्दा नभएको र तस्करी नियन्त्रणमा सरोकारवाला ती दुई कार्यालयले सहयोग नगरेको भन्दै सशस्त्र प्रहरी बल बराह

अन्तिम पृष्ठ

रे कार्यशाला



लागि प्रभू ज्वेलर्स

ज्योतिषकार गुप्ता

भू ज्वेलर्स

पुलावारी (भापा)

मेडिकल हल हण्ड क्लिनिक

नगरपालिका कार्यालय

इटाभन्दा, भन्सारको

शिखर हस्पिटल प्रा. लि.

सिलिगुरी-भापा पेट्रोलियम पाइपलाइन (नेपाल खण्ड- १४.६ कि.मि.) तथा चारआली गिन फिल्ड टर्मिनल आयोजनाको वातावरणीय प्रभाव मूल्यांकन प्रतिवेदन तयारी सम्बन्धी सार्वजनिक सूचना

प्रकाशित मिति: २०८२/०८/१४
कोशी प्रदेश, भापा जिल्ला, मेचीनगर नगरपालिकामा नेपाल अणुबल नियमद्वारा निम्न शर्तानुसारको प्रस्ताव कार्यान्वयन गर्ने तयारिएको छ ।

प्रस्तावकर्ताको नाम र ठेगाना	नेपाल अणुबल नियम निमित्त ईन्जिनियरिङ, परिचोक्ता तथा सूचना प्रविधि विभाग, बबरमहल, काठमाडौं ईमेल: engg@noc.org.np फोन नं: १-२३६९९७२, १-२३६९९७६, १-२३६९९८०
प्रस्तावको व्योहरा	कोशी प्रदेश, भापा जिल्ला, मेचीनगर नगरपालिकामा भापाको मेची पुल नजिक नेपाल भारत सिमान्तर्पित आरजानी बोकसम्म पूर्व-पश्चिम राजमार्गको शेरबाँधकार (ROW) तथा आरजानी बोकसदेखि प्रस्तावित ६०० मिटर टर्मिनलसम्म मेची राजमार्गको शेरबाँधकार भित्र करिब १४.६ कि.मि. लम्बाइमा ८ इन्च व्यास भएको भूमिगत पेट्रोलियम पाइपलाइन बिस्तार तथा भापा आरजानीमा १०,९०० किन्ती लिटर पेट्रोलियम पदार्थ भण्डारण क्षमताको ६० मिटर टर्मिनल निर्माण गर्ने ।
प्रभाव गर्ने सक्ने न. पा. तथा बटुारा	मेचीनगर नगरपालिकामा बटुारा नं. १, ७, ८, ९, १०, १३, १६

सार्वजनिक प्रस्तावको वातावरणीय प्रभाव मूल्यांकन प्रतिवेदन तयारी गर्ने क्रममा यो क्षेत्रको प्राकृतिक, धार्मिक, ऐतिहासिक, सामाजिक, प्रशासनिक, लौकिक, प्रशासनिक र आर्थिक प्रभावमा के बन्तो प्रभाव पर्दछ भन्ने जानकारी गर्न प्रस्ताव कार्यान्वयन गर्ने नगरपालिका तथा त्यस क्षेत्रका विद्यालय, स्वास्थ्य चौकी, सामुदायिक वन तथा सरोकारवाला व्यक्ति वा सम्बन्धित व्यक्ति राय सुझाव लिनु आवश्यक भएकोले यो सार्वजनिक सूचना प्रकाशन भएको मितिदेखि सार्वजनिक भित्र निम्न ठेगानामा आई पुग्ने तथी लिखित राय सुझाव उपलब्ध गराई दिन हुन अनुरोध गरिन्छ ।

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